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Report of Proceedings
of a Study on
**COUNTER-DISASTER
COMMUNICATIONS**

24 - 27 JULY, 1983

Prepared and published by the
Australian Counter Disaster College
Mount Macedon
1984



THE COLLEGE CHARTER

"The role of the Australian Counter Disaster College is to contribute to the development of an efficient Australian counter-disaster capability by training selected personnel in counter-disaster and civil defence requirements; by fostering understanding and co-operation between appropriate elements of the community and by undertaking research into selected aspects of disaster."



COMMONWEALTH OF AUSTRALIA

With the Compliments

of

The Director

Australian Counter Disaster College

Macedon, Victoria 3440.

Telephone: (054) 26 1205

Telex: 34 089



Natural Disasters Organisation
Department of Defence

Report of Proceedings of a Study on COUNTER-DISASTER COMMUNICATIONS

24 - 27 JULY, 1983



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AUSTRALIAN COUNTER DISASTER COLLEGE

COMMUNICATIONS STUDY

24 - 27 JULY, 1983

REPORT OF PROCEEDINGS

TABLE OF CONTENTS (Continued)

	<u>Page</u>
<u>Annex D (continued) :</u>	
Overseas Telecommunications Commission by Mr A Durham, OTC.	114
TELECOM - Communication Capabil- ities During Emergencies by Mr N Ross, TELECOM.	144
Alternative Capabilities Within Australia for Radio Communications in Disaster Situations by Mr J McPhee, Radio Frequency Management Division, Dept of Communications.	188
<u>Annex E :</u>	
State and Territory Position Papers (Precis Versions)	
Queensland - Information on Cairns Area Communications	215
New South Wales	219
Victoria	225
Australian Capital Territory	230
Tasmania	232
South Australia	237
Western Australia	259
Northern Territory	265
<u>Annex F :</u>	
Discussion Exercises	270

AUSTRALIAN COUNTER DISASTER COLLEGECOMMUNICATIONS STUDY24 - 27 JULY 1983REPORT OF PROCEEDINGSINTRODUCTION

1. In June 1976 a Communications Seminar was held at this College with the aim of studying the capabilities and possible counter-disaster roles and responsibilities of various communications agencies throughout Australia. This Seminar identified a need for further study with a view to improving Australian counter-disaster communications capability, both now and in the future.

2. Detailed planning for this further activity, as a study co-sponsored by the Commonwealth Departments of Defence (Natural Disasters Organisation) and Communications, commenced in September 1982. The resultant Communications Study was held at the Australian Counter Disaster College at Macedon, Victoria from 24 to 27 July 1983.

AIM AND SCOPE OF THE STUDY

3. The aim of the Study was:

'To review Australia's capability to provide effective communications in disaster situations both now and in the future, with a view to improving this capability'

4. The Study included a number of presentations by communications authorities set against a general disaster scenario involving a cyclone affecting Cairns, an earthquake in Adelaide, and bushfires in Victoria. Other presentations and discussions included:

- a. the Australian disaster problem;
- b. the general requirements for effective response to disaster, with particular reference to communications and Australian (including

2.

external territories) circumstances;

- c. the current and planned future Australian communications capability for effective response to disaster;
- d. the capability in relation to State and Territory requirements;
- e. measures for improving the capability in the short and long terms, and
- f. training needs.

ATTENDANCE

5. The Study was attended by senior representatives of the appropriate Commonwealth, State and Territory governments, counter-disaster organisations and communications authorities. The list of attendees is at Annex A, but in summary the following were represented:

- a. Commonwealth Government by:

Departments of Prime Minister and Cabinet
Communications augmented by representation
from:

The Australian Telecommunications Commission;

The Overseas Telecommunications Commission
(Australia);

The Australian Broadcasting Corporation;

The Australian Postal Commission;

AUSSAT Pty. Ltd.;

The Special Broadcasting Service.

Industry and Commerce

Special Minister of State (Australian Federal
Police)

Defence (Natural Disasters Organisation and
Defence Communications)

Transport (Coast Watch)

Aviation

Science and Technology (Bureau of Meteorology)

b. State and Territory Governments by:

Counter-disaster Organisations

c. Other:

Australian Council of Trade Unions

Federation of Australian Radio Broadcasters

Federation of Australian Commercial
Television Stations

Public Broadcasting Association of
Australia

Royal Flying Doctor Service of Australia

The Wireless Institute of Australia.

THE STUDY PROGRAM

General

6. Following introductory briefings by staff of the Natural Disasters Organisation and the Australian Counter Disaster College, including a presentation on the "Ash Wednesday" bushfires in the College area and a briefing on the Australian disaster problem, the Study was formally opened by Major General K J Latchford AO Director General of the Natural Disasters Organisation. The keynote address was given by Mr R McKinnon, Chief Services Engineer of the Australian Telecommunications Commission. This was followed by a series of presentations covering current communications capabilities with particular reference to counter-disaster requirements, and including an indication of present and possible future developments in this capability. Four discussion exercises were then undertaken, addressing respectively:

- a. counter-disaster communications requirements;
- b. counter-disaster communications capabilities;
- c. the need for short term improvements to capabilities, and

4.

6. (continued)

- d. the need for long term improvements to capabilities.

7. The Study concluded with a plenary session to consider conclusions reached and to agree on the form of this Report of Proceedings, with closing remarks being offered by the Director General of the Natural Disasters Organisation and Mr E E Payne, Acting Secretary of the Department of Communications.

8. The detailed Study Program is at Annex B.

Opening Address

9. The Director General of the Natural Disasters Organisation, Major General K J Latchford, AO extended a warm welcome to attendees, and emphasised the heavy responsibility which was borne by all of those in every level of counter-disaster planning and operational management in ensuring effective preparations to combat disaster. He believed that effective control and co-ordination of disaster preparedness and response for both peacetime disaster combatting and wartime civil defence, required two essential factors - the right organisation and the correct communications to support that organisation.

10. The Director General briefly reviewed current planning and operational management arrangements at Commonwealth and State/Territory levels, stressing that while the Natural Disaster Organisation had no command role it did have the very important role of co-ordinating the provision of Commonwealth assistance at the request of State and Territory authorities. It was essential, therefore, that State and Territory arrangements should make provision for the effective utilisation of any Commonwealth or external resources provided for their support. In the context of counter-disaster communications management this required that State and Territory disaster plans must allow for the co-ordination of all communications facilities likely to be required in the lead-up to or the aftermath of a disaster. This requirement led to complex problems, given the variety of planning agencies and resource capabilities, and accordingly one of the aims of this Study was to determine collective requirements and capabilities.

11. However, he suspected that the Study deliberations would soon conclude that there was ample capability for communication in Australia, but that the real shortfall was in effective control and co-ordination of that capability. In expressing the wish that attendees would find the Study both fruitful and enjoyable the Director General asked that members should keep the aims of the Study

clearly in mind and should be guided by the understanding that the ultimate success of any plan to ensure effective communication between and to people depended on the individuals at various levels of responsibility and authority in the counter-disaster business.

Keynote Address

12. In opening his keynote address entitled "Communications Management in Disaster Situations", Mr R McKinnon, Chief Services Engineer, The Australian Telecommunications Commission (TELECOM), referred to the diverse range of operations and communications authorities and agencies involved in the response to disaster and indicated that this in itself created problems in the provision of effective communications support to operations. Together with the difficult circumstances which inevitably surround the impact of disaster, and the special demands which control and co-ordination agencies impose on communications, there was clearly a need to provide for effective co-ordination and supplementation of the day-to-day system.

13. In relation to planning, Mr McKinnon touched on the variations which are evident in levels of planning, corresponding to differing experiences and planning bases. He stressed the need for emergency communications to be, as far as possible, part of the day-to-day capability of organisations to ensure operational efficiency, and indicated the need for appropriate budgetary provisions for emergency communications. Whilst Australia has a very significant communications infra-structure, particularly in radio communications, and while TELECOM's network represents by far the largest of the networks available, Mr McKinnon felt that a major challenge to counter-disaster planners was to ensure the co-ordination of all available networks. This required the development of a very close understanding between counter-disaster authorities and the authorities providing the communications links, and the development of management structures appropriate to deal with a variety of forms of disaster.

14. Mr McKinnon also indicated the need to learn from overseas experience (understanding the organisation and experiences of the US Federal Emergency Management Agency in this context) and from our own recorded disaster experience. He demonstrated the importance of auxiliary power services in determining key systems survivability, the need for structural (especially roof) integrity in key installations, the necessity for flexibility in organisational structure and logistical capability, the importance of a mobile radiocommunications capability, and the necessity for planning to cope with the inevitable problems of systems overload in disasters. In regard to

17. (continued)

h. Present Capabilities within Australia for Radio Communications

- by Mr J MacPhee, Radio Frequency Management Division, Department of Communications.

18. The texts of the presentations are at Annex D.

19. In addition, as part of the background material made available during the Study, State and Territory counter-disaster organisations submitted position papers on their counter-disaster communications arrangements. Precis of these position papers are attached at Annex E and further details may be obtained from the appropriate States or Territories.

Discussion Exercises

20. The discussion exercises were undertaken on a syndicate basis, with each requirement being considered in syndicate followed by a presentation of the findings of one syndicate in plenary session. Each syndicate was invited to comment on the presentation in plenary session before the subject was opened to general discussion.

21. Discussion exercise requirements and plenary session findings for each discussion exercise are at Annex F.

Conclusions and Closing Addresses

22. Following plenary discussion of the final syndicate exercise, a further plenary session reviewed the findings of all discussion exercises to confirm the conclusions of the Study (see next section) and to agree the format of this Report of Proceedings.

23. In his closing remarks, Mr E E Payne, Acting Secretary of the Department of Communications, warned of the need, in an era of rapidly changing technology, for the fullest possible consultation with all potential users in matters of equipment and system design. The penalty for not doing so was incompatibility and inefficiency, which would have serious implications in trying to achieve an effective disaster response. He remarked on the importance and general efficiency of TELECOM in the telecommunications field and questioned whether any proposed changes to its charter would necessarily improve either its capability or its performance. He concluded by congratulating the attendees for their evident understanding both of the technology and of the disaster requirement, but emphasised that the success of the Study would be measured by the

8.

extent to which its conclusions could be given practical effect.

24. In closing the Study, Major General K J Latchford, AO, Director General of the Natural Disasters Organisation drew attention to the benefit the Study had gained from the attendance of appropriate level officers from counter-disaster and specialist technical organisations, all of whom had contributed actively in syndicate and central discussions, and thanked attendees for that contribution. He expressed particular thanks to the co-sponsoring department, the Study working party and all those who had prepared and presented formal papers.

25. Recalling that the keynote speaker had thought that the aims of the Study would be almost impossible to attain in the time available, the Director General felt that much had been achieved. Bearing in mind both the difficult circumstances which would inevitably surround the response to disaster and the critical importance of communications to that response, he felt that the Study had properly highlighted the need for the co-ordinated use of the wide variety of communications resources. He stressed the importance of having counter-disaster communications planning organs at Commonwealth State and regional levels, where operational staff and communications staff could work together to ensure that operational requirements for communications could be planned for and met.

26. The Director General concluded by noting that, as he had forecast in opening the Study, it had been recognised that the availability of communications capability was not really the problem in Australia - the need is for co-ordinated planning for the use of that capability and for the co-ordination of the employment of that capability in disaster response.

CONCLUSIONS

General Conclusions

27. The Study arrived at the following general conclusions:

- a. Constitutionally, the States and the Northern Territory have responsibility for counter-disaster activities while the Commonwealth has the responsibility for communications; an effective counter-disaster communications capability therefore depends on co-ordination and co-operation between State/Territory and Commonwealth authorities.

27. b. There does not appear to be a need for new legislation directed at the provision of emergency communications, although existing relevant legislation should be reviewed in the light of the conclusions of this Study.
- c. Noting that the Telecommunications Act 1975 does not specifically identify and acknowledge Telecom's role in counter-disaster response and recognising the central role that the Commission plays in that response, the Study concluded that a review of the legislation would be warranted in that regard.
- d. Although specific deficiencies in the present counter-disaster communications capability were identified and are discussed further in the section on 'Capabilities' below, the Study concluded that there was no over-all shortage of communications capability relevant to Australian counter-disaster communications requirements but that, as also noted in the findings of the 1976 Seminar, the primary need was to establish a co-ordinated planning and operational framework to ensure the effective application of that capability.
- e. With reference to Australian Defence Force (ADF) communications capabilities, the Study recognised that while these capabilities were generally suited to counter-disaster communications requirements and would continue to be made available in this role where possible, ADF resources were finite and were designed and dedicated to a primary defence need and role. It was expected that while the ADF capability would continue to improve for Defence reasons, its availability would continue to be subject to the demands of its primary role.

Counter-Disaster Communications Requirements

28. In relation to requirements, the Study concluded that:
- a. The primary requirement is survivability, best achieved by the establishment of a dedicated emergency communications network;

10.

28. b. Priorities for the development of counter-disaster communications were for systems to ensure:

- (1) intra-State/Territory co-ordination;
- (2) intra-State/Territory command and control;
- (3) effective interaction between co-ordination and control systems within each State/Territory;
- (4) effective inter-State/Territory/Commonwealth co-ordination;
- (5) effective public information and education, and
- (6) effective operation of public inquiry systems (e.g., the National Registration and Inquiry System).

- c. In the development of such systems, the primary purpose is to ensure the control and co-ordination of all communications resources to meet the following requirements in the major phases of counter-disaster management:

- (1) in the Disaster Preparedness phase -

- * Planning
- * Provision of alternative networks and equipment
- * Establishing operational procedures (especially in such areas as warning system activation etc.)
- * Ensuring effective operational performance by appropriate staffing and training, exercising and technical support.

- (2) in the Disaster Response phase -

- * The activation of systems monitoring
- * The determination of systems status
- * Reviewing priorities

- * Redesigning and modifying systems as necessary
 - * Implementing new or modified systems
 - * Constant monitoring and review to maintain capability.
- d. In the development of a full national counter-disaster communications system, interaction must be assured within and between the following:

<u>At government level</u>	<u>At organisational level</u>
Commonwealth	National
State/Territory	State/Territory
Region/Division	Region/Division
Local	Field units

Counter-Disaster Communications Capabilities

29. In relation to capabilities, the Study concluded that a number of deficiencies in current capability could be identified, and offered possible solutions in respect of some of these deficiencies. The identified deficiencies were:

- a. Overload of the TELECOM network is probable in disasters.

Possible solutions:

- * Provide dedicated lines to emergency services;
- * Provide priority access for appropriate counter-disaster organisations to the switched telephone network (STN);
- * Provide for high security plus diversity for selected lines

- b. TELECOM cabling is susceptible to damage in disasters.

Possible solution :

- * Provide the necessary interface equipment to STN from a stock-

12.

piled and pre-positioned store or stores, to permit a line/radio interface. In this respect, the possible employment of Emergency Communications Systems Modules (ECSMs - see Radio Frequency Management Division presentation at Annex D) should be further investigated.

- c. There are problems of interface between radio and telephone switching.

Possible solution:

- * See b. above.

- d. There is an inadequate response capability to handle public inquiries.

Possible solution:

- * Establish the National Registration and Inquiry System or its replacement remote from the disaster area and give maximum priority to the maintenance of up-to-date data and the transmission of information as a basis for public inquiry response.

- e. Broadcast systems are vulnerable to damage during disasters.

Possible solutions:

- * Satellite Receive Only (SRO) terminals
- * Another TEBS
- * Link equipment between existing broadcasting facilities
- * Direct satellite broadcast facilities

- f. There are limitations in the capability of counter-disaster groups to intercommunicate by radio.

Possible solutions:

- * Improved radio frequency planning by users
- * Initiate a major frequency re-assignment/rationalisation program (similar to that undertaken in Tasmania)

- g. There is an inadequate fixed service system to remote and underserved areas.

Possible solutions:

- * AUSSAT Homestead and Community Broadcasting Satellite Service (HACBSS)
 - * Completion of planned TELECOM microwave links in remote areas
 - * INTELSAT ABC TV (possibly also commercial) for remote area mining towns (receive only) pending inauguration of the AUSSAT System
 - * Use of the maritime telex/telephone interface capability
 - * Use of the Royal Flying Doctor Service facility, which can provide a nationwide and if necessary international HF simplex SSB RT service, particularly to and from remote areas
- h. There is a shortage of TELECOM mobile services
- i. TELECOM lacks physical diversity in some areas.

Possible solutions:

- * Utilise the capability for TELECOM/OTC single-hop satellite usage for trans-continental diversity in some areas
 - * Complete the broadband system routes in Northwestern Australia
- j. Public information systems are inadequate.

Possible solutions: Introduce -

- * 'recorded response' systems;
 - * 'queueing' systems, and
 - * improved media liaison systems.
- k. There are some identifiable systems and equipment deficiencies.

Possible solutions: Provide more -

- * data links;
- * video links;
- * media links, and

* training support for these.

1. Australian Defence Force backup is vulnerable due to TELECOM links ('tails') between DISCOMNET/DISCON and users.

Possible solution:

* Provide microwave bearer or similar alternative to TELECOM 'tails'

Short Term Improvements to Counter-Disaster Communications Capabilities

30. The Study agreed to establish a short term time-frame of five years (up to 1988) for the implementation of practical improvements to capability. Within this time-frame, it was concluded that the following improvements were both desirable and practicable:

a. TELECOM

- (1) Improved national network management systems to ensure appropriate emergency services and affected public access to the STN in disaster situations.
- (2) Planning for an alternate STN (electronic or hardwire systems).
- (3) Planning for point-to-point landlines to support counter-disaster command and control structures.
- (4) Ensuring transmission medium diversity, including radio and cable diversity at the subscriber end (route diversity and physical protection).
- (5) Establishing controlled and agreed conditional access to shared antennae sites.
- (6) Establishing the capability for acquiring access to the STN at less congested sites (remote from the disaster area).
- (7) Completing the national broadband coverage (specifically to/through remote areas).

- b. Frequency allocations. A Department of Communications/States and Territories Working

Party should be established to resolve problems relating to counter-disaster operational communications.

- c. Licensing. The Department of Communications should rationalise the licence fee structure for all counter-disaster services.
- d. Operator procedures and training. State/Territory counter-disaster organisations should rationalise and implement a standard national operational procedures manual applicable to all affected services including WICEN and CREST.
- e. Planning committees. State Counter-Disaster Communications Planning Committees (where these were not presently in operation) should be formed, followed by the establishment of a National Counter-Disaster Communications Planning Committee.
- f. Overseas Telecommunications
 - (1) Department of Foreign Affairs should be requested to establish public inquiry procedures in appropriate overseas posts, and authenticated situation reports should be provided to such posts in time of disaster.
 - (2) Liaison should be formalised between relevant Emergency Operations Centres and the OTC international network management control centre for information flow.
 - (3) Automatic call diversion should be provided to recorded announcements for calls to the disaster area.
 - (4) Small groups of circuits should be dedicated for calls to the disaster area.
 - (5) Existing HF mobiles should be modified to permit operation in maritime mobile telephone and telex services via Coastal Radio Service stations.
 - (6) Direct dial RADPHONE service at Coastal Radio Service (CRS) stations should be expanded (may be necessary only at selected stations).
 - (7) The Overseas Telecommunications Act 1946 should be amended to provide for a counter-disaster response obligation.

16.

- (8) Aircraft HF equipment should be modified or adapted to permit operation within the maritime mobile/SOLAS service (this is already available for coastal surveillance aircraft).
- (9) Provide simplex telex on radio/amateur telex on radio equipment in HF mobiles to permit access to the national telex network through CRS stations for hard copy requirements.
- (10) Expand telex on radio capability at CRS stations.

g. Broadcasting

- (1) A strategy should be developed for broadcasting access to special audiences, including minority and geographical groups.
- (2) A Code of Ethics for the reporting of disasters should be developed and implemented through the Media Council of Australia, the ABC and the Special Broadcasting Service.
- (3) Procedures should be established for the authenticated release of counter-disaster bulletins to the media by Commonwealth and State/Territory counter-disaster authorities.
- (4) The need for and format of a communications national alert signal and logo for use in educating the public in disaster awareness prior to and at the onset of an emergency or disaster should be assessed.

h. Telecommunications Directory. A Telecommunications Directory, in the form of an overall Commonwealth facilities summary with detailed annexes for each State and Territory, should be formulated, managed, distributed and maintained. This Directory should list services and key contacts, by appointment.

i. Satellite services. Strategies should be developed to provide counter-disaster authorities with priority access to satellite services (e.g. AUSSAT) in times of disaster.

Long Term Improvements to Counter-Disaster Communications Capabilities

31. The Study agreed to establish a long term time-frame up to the year 2000 for the implementation of practical improvements to capability. Within this time-frame, it was concluded that the following improvements were both desirable and practicable:

a. Developments in satellite communications should include :

- (1) fixed (transportable) and mobile earth stations (with appropriately trained personnel);
- (2) facilities to overcome convergence;
- (3) compatible radio systems;
- (4) improved capability to broadcast via satellite to domestic receivers (with an ability to uplink from workplace equipment), and
- (5) possible real-time observation satellite services.

b. In the immediate disaster area, the following developments should be sought:

- (1) the development of cellular radio systems, especially for urban emergencies and disasters;
- (2) UHF multi-channel equipment and translators;
- (3) new generation telephone/telex/FAX equipments;
- (4) video systems;
- (5) portable/mobile data systems, including:
 - * intelligent terminals
 - * hold-review-transmit facilities
 - * full EOC display/input facilities, and
- (6) electronic recording.

18.

Note: The potential role in this area for the Emergency Communications System Module (ECSM - see paragraph 26.b. above) was recognised.

- c. In the area of Commonwealth/State/territory co-ordination, attention should be given to improved telephone and telex systems and to new systems for data, video and FAX.
- d. A major role was foreseen for new services in data communication which would provide for improved and more efficient operator control, information collection and information dissemination.
- e. In relation to operator training, more attention should be given to the development of 'user-friendly' equipment and to the provision of adequate funding for training.
- f. While it was recognised that total equipment commonality was unattainable, in the interests of interoperability and ease of use more attention should be given to the introduction of 'user-friendly' equipment, systems translators, specifications and standards compatibility, quality assurance and acceptance provisions.
- g. With regard to dedicated back-up systems, a need was recognised for all agencies to maintain adequate reserves and to be prepared to fulfil their planned obligations. While dedicated back-up systems should be developed as far as practicable, there was clearly a need to plan for alternative systems and usage to provide an adequate 'fall-back' in disasters.

COMMUNICATIONS STUDY

ANNEX A

24 - 27 JULY, 1983

LIST OF ATTENDEES

A. COMMONWEALTH GOVERNMENT

Department of Prime Minister and Cabinet

J B Neil

Community Development Branch

Department of Communications

a. Central Office Divisions

J P Coleman

Policy, Analysis and Co-ord Branch

G R Hughes

Radio Frequency Management Division

D Jender

Broadcasting Division

J W McPhee

Radio Frequency Management Division

N B Warnock

Broadcasting Division

b. Regional Offices

H Melling

State Manager, Tasmania

c. The Australian Telecommunications Commission

K M Bartsch

Engineer, South Australia

J C Beaton

District Manager, Queensland

G Morris

Superintending Engineer, Victoria

N G ROSS

Engineering Department, Head Office

G Shaw

Senior Engineer, Northern Territory

S A Young

Superintending Engineer, Western
Australia

20.

d. The Overseas Telecommunications Commission

A F Durham Radio Operations

e. The Australian Broadcasting Corporation

D Andrew Engineering (Radio)

M J Johnson Security and General Services

f. The Australian Postal Commission

J C Ramm Service Performance and Security

g. AUSSAT Pty Ltd

C G Elston Communications Systems Analysis

D Kennedy System Manager

h. The Special Broadcasting Service

C Shaw Radio News and Current Affairs

Department of Industry and Commerce

J R Lee Security

Department of Special Minister of State

St Sgt P B O'Boyle Australian Federal Police

Department of Defence

R Herron Natural Disasters Organisation

MAJ K S Twining Joint Communications Electronics
Branch

Department of Transport

H K Duncan Coast Watch

Department of Aviation

J B McIver Search and Rescue

Department of Science and Technology

J R Dear

Bureau of Meteorology

B. STATE/TERRITORY COUNTER-DISASTER ORGANISATIONSa. Queensland

G A Deane

Premier's Department

K D Whiting

State Emergency Service

b. New South Wales

Sgt J C Redman

Police Department

E A Taylor

State Emergency Service

c. Victoria

Insp B E Bingham

Police Department

Ch Insp G R Richards

" "

d. Tasmania

B J Harper

Hydro-Electric Commission

J M Paul

State Emergency Service

e. South Australia

Supt B Gamble

Police Department

Supt W J Tate

" "

f. Western Australia

D L Hill

State Emergency Service

J I P Wright

" " "

g. Northern Territory

E J Simmons

Emergency Service

Ch Insp M H Smith

Police Force

h. Australian Capital Territory

A J Frazer

Emergency Service.

C. OTHERAustralian Council of Trade Unions

A Forster

Federal Industrial Officer, ATEA

Federation of Australian Radio Broadcasters

J H Finlayson

Federal Secretary

Federation of Australian Commercial Television Stations

A Thompson

Director, Member Services

Public Broadcasting Association of Australia

B D Walsh

Vice President (Television)

Royal Flying Doctor Service of Australia

G Baker

Engineer

The Wireless Institute of Australia

R Henderson

Federal WICEN Co-ordinator

COMMUNICATIONS STUDY24 - 27 JULY, 1983PROGRAM1. Sunday 24 July

1830 Delegates Assemble at ACDC

1900 Buffet Dinner

2000 Briefings in
Knox Knight HallMr R Eather
Senior Training Officer
Australian Counter
Disaster College2. Monday 25 July0830 - The Australian
0900 Disaster ScenarioBRIG IGC Gilmore
Director ACDC0900 - Welcoming Address
0910MAJGEN K W Latchford, AO
DG NDO0910 - Communications
0920 Experience
in DisastersMr R Herron
Executive Officer,
Communications, NDO0930 - Keynote Address
1030Communications
Management in
Disaster SituationsMr R McKinnon
Chief Services Engineer
Telecom Australia1045 - Defence
1130 CommunicationsMAJ K Twining
Dept of Defence1130 - Broadcasts and
1215 Emergency
BroadcastingMr D Kelly
Assistant Secretary Broad-
casting Policy Branch
Dept of Communications1330 - Australian Domestic
1415 Satellite SystemMr D Kennedy
Systems Manager1415 - Overseas
1500 TelecommunicationsMr A Durham
Manager, Radio Operations
Overseas Telecommunicat-
ions Commission1515 - Australian
1630 Telecommunications
Commission (TELECOM)Mr N Ross
Special Duties
Engineering Department
Telecom Australia2000 - Panel Discussion
2100

24.

3. Tuesday 26 July 1983 - Capabilities and Requirements

- 0930 - Present Capabilities Mr J MacPhee
1030 within Australia for Manager, Licensing,
Radio Communications Radio Frequency
Management
Dept of Communication
- 1030 - Counter-Disaster Commu- Mr R Herron
1040 nications Requirements NDO
- 1050 - Briefing and Consider-
1230 ation of Counter-
Disaster Communications
Requirements
- 1330 - Discussion - Counter-
1500 Disaster Communications
Requirements
- 1515 - Briefing and Consider-
1625 ation of Counter-
Disaster Communications
Capabilities
- 1625 - Discussion - Counter-
1730 Disaster Communications
Capabilities
- 1830 for 1900 Study Dinner

4. Wednesday 27 July 1983 - Short and Long Term
Improvements

- 0800 - Briefing and Consider-
0930 ation of Short Term
Improvements
- 0930 - Discussion on Short
1030 Term Improvements
- 1045 - Briefing and Consider-
1230 ation of Long Term
Improvements
- 1330 - Discussion on Long
1430 Term Improvements
- 1430 - Study Conclusions
1515
- 1530 - Study Summary and Mr E E Payne, Acting
1600 Closure Secretary,
Department of
Communications.
MAJGEN K W Latchford,
AO, DGND.

AUSTRALIAN COUNTER DISASTER COLLEGECOMMUNICATIONS STUDYKEYNOTE SPEAKERS ADDRESSMR R MCKINNON, CHIEF SERVICES ENGINEER TELECOMCOMMUNICATIONS MANAGEMENT IN DISASTER SITUATIONSINTRODUCTION

Ladies and Gentlemen, my examination of the papers proposed for presentation and the topics for syndicate development indicate that you have a very challenging three days ahead of you. Any discussion on communications these days is difficult as the subject is vast and complex and the technological rate of change is high. At this study we intend to integrate and relate this dynamically changing subject to another subject - that of disasters warning. The diverse range of authorities and organisations involved in communications tends to be matched with an equally diverse range of counter disaster organisations and as you are all well aware, the achievement of a positive result tends to be in inverse proportion to the number of participating interest groups. Hence communications management in disasters is a difficult problem which must be resolved because the control and co-ordination of operations will be completely dependent on adequate and reliable communications. This criterion was put most succinctly by General Omar Bradley of the USA Army when he said "Without communication, all I control is my desk, and that's no lethal weapon."

SUPPLEMENTING EXISTING SYSTEMS

The operation of our communication facilities can be likened to the family car. Generally speaking it is fairly reliable provided we keep it tuned up from time-to-time. We tend to take its operation for granted. However when it has a bit more stress placed on it, like the annual family holiday on a hot January day, it chooses the most inappropriate time to break down. Similarly the communications requirements of participating authorities in day-to-day situations are basically met by their private systems as well as the public switched Telecom facilities. During the onset of a disaster however, experience has shown that these facilities require supplementing.

The reasons for this are:

- * The higher than normal communications traffic generated by participating authorities will almost certainly exceed the capacity of their normal operational facilities.
- * the increased traffic use of the Telecom network may result in local or general congestion which will restrict its normal availability.

- * the establishment of disaster communications systems for co-ordination purposes requires provision of exclusive point to point circuits linking authorities, the scene of the disaster and the co-ordination centre or centres.

PLANNING

In recognising that disaster situations call for specialised communication facilities and needs, the question then arises as to how far we should go in developing contingency plans or in providing facilities. Even within the Telecom organisation there is a divergence of view between the State administrations which have considerable autonomy within their areas of control. These range from the Victorian administration which has set up an emergency network of nominated circuits throughout the State capable of providing a point-to-point communication facilities via magnet telephone when required; to the New South Wales administration which relies on local contact at the District Telecommunications Manager level supported by the marshalling of the resources necessary to meet the disaster situation as and when it arises. To an extent this divergence in outlook has developed from the degree of reliance placed upon Telecom's State administration by the State Emergency co-ordinators for emergency communications.

In comparison with many other overseas countries Australia has been relatively free from significant disasters. This makes contingency planning a more difficult process as experience is the best teacher; in the absence of a continuing experience it is difficult to maintain enthusiasm or to marshall the support for funding contingency measures. Projects which can assume great urgency and importance in the aftermath of disaster frequently fade with time and the competition of other projects for the limited funds available.

A balance must be struck between insufficient contingency planning whereby valuable time is lost whilst plans are formulated, to overplanning where plans are either out-of-date because of the massive updating required or the administrative effort to update become too onerous.

The same arguments can be applied to facilities for emergency communications. Wherever possible these should form part of the day-to-day operations of the organisation which will tend to ensure that they will be operational when the emergency arises, and avoid the need for routine checking of speciality equipment.

Such a proposition must acknowledge the ever present conflict with cost. Sound arguments will require development to extend the normal processes beyond cost/benefit limitations. Authorities such as Telecom operate on business principles where capital outlays must be related to favourable rates of return. There is some flexibility within capital works programmes for improvements in survivability of the network where this impacts on its normal functioning. As indicated in the Telecom briefing paper, growth in the network permits the opportunity to incorporate survivability measures such as diversity and redundancy.

It would appear though that the seeking of funds for special counter disaster network planning should be the task of a specialised agency with federal and state affiliations. It is possible that the arguments developed in the industrial accident areas where the cost to the community of these accidents far exceeds the direct costs could be applied to disaster situations such as the recent Victorian bushfire where close to 50 people perished and the direct cost of damage approximated \$200m.

Local Organisational Needs

I believe the message will come through the various briefing papers to be presented that in Australia we have a very significant infrastructure of communication media, particularly in the radio communication area. Whilst Telecom's network represent the largest by far if these other networks, the challenge to counter disaster planners is how best to tap these other resources and co-ordinate their contributions in particular disaster scenarios. The importance of management is a key aspect in counter disaster planning. All too frequently considerations of providing for emergency facilities and equipment causes organisations to overlook the essential requirement to get people into the right place with the necessary power to perform the allotted tasks. The ability to function effectively and to operate flexibly as the disaster picture unfolds places great stress on an unplanned organisational structure. Planned management structures based on previous disaster scenarios will enable personnel to be deployed to best advantage.

Management structures and the key personnel may need to be varied to deal with different forms of disaster. We would want to avoid situations as reported in the recent Victorian bushfires where there were several fire-fighting authorities with defined areas of responsibility for normal

operations but no nominated expert in charge of their activities and the different authorities operating under different stages of the Disaster Plan. I also would pose the question as to whether the lines of demarcation between state control and the need for Federal intervention are sufficiently developed? Presently the state must ask for federal aid before this can be rendered in the case of a state disaster. Can more be done to avoid the loss of valuable time in bringing federal resources and co-ordination measures to bear in a disaster?

In formulating disaster plans embracing communication requirements there should be developed close understanding between authorities responsible for their disaster function and the authorities providing the communication links, which of course are vital to the performance of the disaster function. Such understanding would indicate on many occasions the establishment of the emergency field centre at a point closer to the availability of diverse communication media capability eg high speed data service, rather than the more remote but functionally attractive disaster scene.

Implicit in the three disaster scenarios chosen for the study is the need to cater for the needs of hundreds of thousands of homeless people in localities remote from their normal environment. This would pose enormous problems for welfare organisations, hospital and medical authorities etc. The displacement of vast population numbers and the need to maintain communications with concerned relatives and friends both home and overseas would place extremely heavy and abnormal demands on a network already affected by the size of the calamity. Thus overall planning of networks must aim at not only improving the survivability of existing networks during the disaster, but ensuring their viable operation during the inevitable stress period which follows these events. This is one of the reasons why Telecom is examining techniques of network management which aim to optimise the through put of successful calls when the network is heavily overloaded through failures and/or abnormally high traffic loads.

It is interesting to note the organisational arrangements for handling disasters (natural or man-made) in the United States and to consider their applicability to Australian conditions.

Firstly there is the Federal Emergency Management Agency created in 1979 to act as a single co-ordination point for emergency preparedness and response in the federal structure. It became an amalgamation of previously autonomous agencies and of functions that had been of secondary importance in other agencies. The effect was to consolidate and centralise co-ordination and the management functions, although the Defence Department was still responsible for military

readiness, Health Services for national emergency health services planning and so on. The Agency responded to state and local community disasters and assisted the States in planning for emergencies, runs the civil defence program, the emergency broadcast system, the strategic stockpile and natural hazard mitigation programs.

Moreover in 1981 an Emergency Mobilisation Preparedness Board was established whose focus is on catastrophic disasters - emergencies of far greater scope than the isolated natural disaster which cannot be handled without extraordinary measures. Under the Board are 12 working groups serving as forums and more technical discussions, and as mechanisms for formulating interagency recommendations on preparedness issues. One of the working groups - the Emergency Communications Working Group - examines the state of communications capabilities with a view to affecting improvements.

One of the key functions of the Board is to monitor progress on the implementation of recommendations for as the Director of the Board put it recently: "It has, unfortunately, been the case that little has been done to correct deficiencies in preparedness planning that have been identified over the years in the readiness exercises played by civilian and military agencies and in consultant reports and agency studies. This may come as a surprise to some of you, but there have been enough studies on preparedness and mobilization to fill a small library ... The missing piece has been that no one has had the clout to see to it that agencies correct these deficiencies It did not have a high enough priority to command consistent - persistent may be a more appropriate word - management attention".

Review

It is important that we adequately review the experience that has been gained during disasters in Australia and also overseas. Each disaster report examined in isolation may contain recommendations which appear minor but which becomes a repetitive thread in other situations and therefore worthy of implementation.

First and foremost although disasters are diverse in nature and infrequent in the Australian context there is a certain predictability in their occurrence and locations. Consider as an example the words of Judge Stretton in his report of May 1939, almost 44 years ago (Attachment). In 1851, 1939 and 1983 the extreme bushfires in Victoria were preceded by extensive droughts which should have provided the trigger for intensive surveillance and mitigation measures. But for the dates and a few minor detail changes Judge Stretton's words might have been written on Thursday 17 February 1983.

Power Supply

In most disasters of the fire, flood, cyclone, earthquake variety it may safely be assumed that there is going to be a loss of commercial power supply. Therefore the extent to which auxiliary power sources can be provided to key communication facilities will determine its survivability. Even these provided there are additional problems that can be encountered as evidenced in Telecom disaster reports:

- * Hobart bushfires (1967) - higher than normal power drain on rural telephone exchanges caused through fire damaged external plant or the telephone traffic generated in the wake of the fires caused the premature failing of battery power supplies.
- * Brisbane flood (1974) - location of auxiliary units in basements which became inaccessible due to flooding
 - mobile emergency generators are of little use when an exchange is isolated by flood-waters
 - need for strategic placement of emergency power plant in installations prone to flooding.
 - Darwin cyclone (1974) - higher than normal power drain on telephone exchange batteries due to water entry and damage to customer's services
 - failure of the standby diesel alternator to automatically start at the key Smith Street Building due to water entry.
- * Port Hedland cyclone (1975) - failure due to thermal overload of standby plant resulting from exhaust duct cooling air being unable to escape; manual restart could not be effected as staff were unable to reach the nearby remote auxiliary power building with safety.

Building Integrity

Another important factor is building integrity, particularly the roof design. The dependency of communications equipment on the maintenance of a closely controlled environment must be recognised and building designs should provide for complete protection at all times. Reports based on the Darwin and Port Hedland cyclones and Brisbane floods highlight the need to waterproof air-conditioning vents etc. against wind driven rain and particular care related to

scrutiny of subsequent building modifications which could weaken building integrity. Where buildings are unavoidably located in areas subject to floods, careful consideration should be given to placing vulnerable equipment in upper floors where practicable.

Organisation

Local knowledge of geography, organisation, staff, telephone trunking arrangements and depot locations etc. become of utmost importance in times of crises. For this reason it is generally not possible to pour massive resources into the area because each restoration team needs at least one team member with the requisite local knowledge. Normal organisational units need to be shaped in such a way that they can be rapidly expanded and appropriately reinforced when faced with sudden and widespread emergencies, rather than form up a new organisational units.

The question of transport, both men and materials, poses the logistical problems of size and capability of vehicles, whether they be land, sea or air based. The necessity to concentrate special skills appropriate to the disaster concerned is required while at the same time recognising the loose management organisation of the whole complex of the Counter Disaster organisation involving federal, state and local authorities. The near disaster at the Three Mile Island nuclear power plant demonstrated the advantages of assembling a "think-tank" of technical experts from various organisations to formulate strategies for reducing the hazard on a consensus basis.

Allied to the requirement to transport the right people to the disaster scene speedily is to ensure their availability at the right time. How frequently does disaster strike at what is the inappropriate time. Darwin cyclone on Christmas Eve! Brisbane floods on Australia Day holiday weekend! Peak bushfire season during the peak holiday period!

Contingency plans of necessity must contain alternative personnel names to cover for absent specialist staff or at least contact details to enable return to duty arrangements to be made.

Mobile radiocommunications

Generally previous disaster reports have indicated that emergency operations would have been severely handicapped but for the provision of mobile radio communication. The reports have also indicated some shortcoming as well. In some cases the range of coverage was considered limited due to inadequate antenna height but in bush fire disasters it appears that communications are partially affected. The Coroner

investigating the "Lara" fire in Victoria in 1969, when a number of people lost their lives on the Geelong Road, suggested that a breakdown in radiocommunications had contributed to the tragedy. Problems of this nature have been referred to at the communications seminar "COMCON 82". Scanlon in his paper "Crisis Communications - the Ever-Present Gremlins."

Following the Lara incident the Telecom Research Laboratories carried out an investigation into the behaviour of mobile radiocommunications systems under extreme bushfire conditions including radio propagation studies. By arrangement with the Department of Supply a firestorm experiment - Project Euroka - took place in Queensland in 1969. It was not able to be concluded from this experiment that adverse propagation phenomena which are theoretically possible were of any practicable significance.

In addition to adverse propagation, other possible causes of unsatisfactory performance of radio systems under bushfire conditions are equipment malfunction and operational factors. In the administrative situation facing counter disaster groups there are problems in monitoring high performance standards with units that are possibly privately owned sometimes old and intermittently employed. Operational factors are obviously important also, for example, a radio system may be due to personnel being too heavily committed in their fire fighting activities to man their radio installations continuously.

In their popular press following the recent Victorian bushfires there was a reference to the inability of different organisational groups to inter-communicate by mobile radio due to equipment incompatibility. Deficiencies in this area in Tasmanian operations were highlighted following the 1967 fires, resulting in the development of the Tasmania Radiocommunications Plan, unique in Australia and perhaps the world. Substantial detail of this Plan is given in the Department of Communications paper. It has the attribute of enabling the overall network controller to belong to the organisation with prime responsibility for the disaster with up to 46 operational channels to combat an emergency. Co-ordination between all groups is possible because all participants have access to the State-wide liaison frequency.

Network Congestion

The final point I would like to make in reviewing past disasters is that communication networks generally become unreliable for passing priority information during, and in the period following, the disaster. It will be seen later in the Telecom capabilities paper that the Telecom network does a very good job in handling the telephone traffic it

was designed for, i.e. each member of the public has got equal opportunity with his neighbour of obtaining a free circuit to his called number. It is when we want to give priority to a particular caller or a particular service and there is an abnormal overload on the network that there could be difficulty.

It is in emergency situations that there is generated a need for this type of service. The emergencies may be of an individual nature such as the requirements of persons in distress to gain contact with the police, fire or ambulance via the '000' service or it may be as a result of a more widespread disaster such as bushfires or floods, where the lines are required to be set up between co-ordinating authorities. To date these tie lines have not been set up in advance, as they would remain idle in between disasters and this could not be justified. However, the time taken to set up such links whilst only a few hours, is valuable time lost to co-ordinating authorities.

As Telecom moves towards centralisation of its manual assistance (operator) facilities for efficiency reasons it become more difficult to sustain the integrity of services such as '000' without the need for special arrangements. One of these arrangements which appear promising and is currently being field trialled is the use of stored program controlled PABXs to receive '000' calls which can be quickly transferred to the appropriate emergency facility. It is not difficult to visualise how such a facility, were it to be taken over by a federal or state emergency service could be enhanced to provide a basic switched network for emergency calling at the onset of a disaster situation. You may wish to give further thought to this aspect in your later deliberations.

The approach accords with Telecom's long term aim and is consistent with methods used overseas (for example, Sweden) to place management of the '000' service with those responsible for the end result. A prime aim of this method is to remove the requirement for Telecom operators to interrogate often distraught callers in emergency situations about their location in order to determine which office of a particular emergency service is required. The training of operators and the updating of emergency records can be more effectively handled by those trained in these areas.

Whether or not such special networks emerge, Telecom is committed to improving management of its network during abnormal traffic loading. Recorded voice announcements requesting people to defer their calls have met with mixed results, but there are obvious advantages in having public enquiry numbers at locations remote from the disaster to better

equalise traffic loadings on the network. Telecom is currently examining the range of network control techniques used overseas in networks similar to that of the United States of America, for their applicability in the Australian environment.

Conclusion

Communications management is a critical item in counter disaster planning and operations, both during the onset of the disaster and in its wake. Proper management can provide a vital boost to our confidence and ability to monitor and to verify adherence to pre-planned co-ordination roles of all contributing personnel. However it is probably true and important to recognise, that whatever post major disaster is analysed, we so frequently encounter the experience that something has gone wrong with communications. There is not only the factor of technical failure but operational failure as well. There is plenty of scope for improvement and I feel confident that this study at Macedon will contribute substantially to that aim.

ATTACHMENT

EXTRACT FROM REPORT OF JUDGE LEONARD B STRETTON WHO HEADED
THE ROYAL COMMISSION INTO THE VICTORIAN BUSHFIRES IN 1939

"In the State of Victoria, the month of January of the year 1939 came towards the end of a long drought which had been aggravated by a severe hot dry summer season.

For more than 20 years the State of Victoria had not seen its countryside and forests in such travail. Creeks and springs ceased to run. Water storages were depleted. Provincial towns were facing the possibility of cessation of water supply.

In Melbourne (the) inhabitants were subjected to restrictions upon the use of water. Throughout the countryside, farmers were carting water, if such was available, for their stock and themselves.

The rich plains denied their beneficent rains, lay bare and baking; and the forests, from the foothills to the alpine heights, were tinder.

The soft carpet of the forest floor was gone; the bone-dry litter crackled underfoot; dry heat and hot dry winds worked upon a land already dry, to suck from it the last, least drop of moisture.

Men who had lived their lives in the bush went their ways in the shadow of dread expectancy. But though they felt the imminence of danger, they could not tell that it was to be greater than they could imagine. They had not lived long enough. The experience of the past could not guide them to an understanding of what might, and did, happen.

And so it was that, when millions of acres of the forest were invaded by bushfires which were almost State-wide, there happened, because of great loss of life and property, the most disastrous calamity the State of Victoria has known.

These fire were lit by the hand of man.

Seventy-one lives were lost. Sixty-nine mills were burned. Millions of acres of pine forest, of almost incalculable value were destroyed or badly damaged.

Townships were obliterated in a few minutes. Mills, houses, bridges, tramways, machinery were burned to the ground; men, cattle, horses, sheep were devoured by the fires or asphyxiated by the scorching debilitated air.

On that day it appeared that the whole State was alight. At midday, in many places, it was as dark as night. Men carrying hurricane lamps, worked to make safe their families and belongings.

Travellers on the highways were trapped by fires or blazing fallen trees, and perished. Throughout the land there was daytime darkness.

Steel girders and machinery were twisted by heat as if they had been of fine wire. Sleepers of heavy durable timber, set in the soil, their upper surfaces flush with the ground, were burnt through. Other heavy woodwork disappeared, leaving no trace

When the fire was most intense the soil was burnt and destroyed to such a depth that it may be years before it shall be destroyed by the slow chemistry of Nature.

The speed of the fires was appalling. They leaped from mountain peak to mountain peak, or far out in the lower country, lighting the forests six or seven miles in advance of the main fires.

Blown by a wind of great force, they roared as they travelled.

Balls of crackling fire sped at a great pace in advance of the fires, consuming with a roaring, explosive noise, all that they touched. Houses of brick were seen and heard to leap into a roar of flame before the fires had reached them.

Such was the force of the wind that, in many places, hundreds of trees of great size were blown clear of the earth, tons of soil with embedded masses of rock, still adhering to the roots; for the mile upon mile the former forest monarchs were laid in confusion, burnt, torn from the earth, and piled one upon another as matches strewn by a giant hand.

There had been no fires to equal these in destructive intensity in the history of settlement in this State, except perhaps the fires of 1851, which, too, came at summer culmination of a long drought.

by

ANNEX DMr Robin Herron

1. For the remainder of today and half of tomorrow we are going to be deluged with information on what we have and might have in the way of counter disaster communications, today and in the future. You have heard General Latchford summarise the aim of this study. I hope that we are all prepared to lay aside bureaucratic principles and share our perceived problems without restraint; for if not, we will have wasted our time.

2. In the next few minutes, to set the scene, I want to give you some generalised examples of communications experiences in disasters both within and external to Australia. In no sense am I apportioning blame. We need to look at experiences both in the immediate disaster area and back at the co-ordinating/controlling headquarters. In so doing we must also examine the pre-disaster, disaster and post-disaster phases.

Communications in the Immediate Area

3. In terms of facilities, we would have:

- * fixed and mobile VHF/UHF/HF radio in a wide variety of organisations
- * local telephone telex and data landlines or microwave links
- * local radio and television

4. During the pre-disaster phase and assuming some warning had been received, communications usage would focus on:

- * radio and TV broadcasting warning
- * checking of all local counter disaster radio circuits
- * alerting counter disaster teams by radio and telephone
- * reporting back to regional and State/Territory and Commonwealth counter disaster headquarters by telephone, telex and perhaps radio.

5. When the disaster strikes, its effect will vary according to type and to the affected area. In general we could expect:

- * disruption to broadcast facilities in the area
- * loss of Telecom land lines and microwave links

38.

- * damage to fixed communications facilities eg., local SES/TES or police headquarters.

6. In the immediate post-disaster phase, communications priorities are likely to be:

- * radio communication by whatever means and through all available and serviceable circuits, to identify the scope of damage and resources required
- * line/microwave communication by telephone/telex/data to
 - report back to regional/State/ Commonwealth authorities, requesting aid where required
 - provide facilities for media use within the disaster area
- * restore a radio/TV broadcasting capability or augment by extending adjacent area transmitting power or by lifting in a facility such as the Transportable Emergency Broadcasting Station (TEBS).

7. Examples of typical problems encountered include:

- * total loss of telephone/telex/data landlines from damage such as fire
- * loss of local telephone exchanges from fire or flood
- * loss of local disaster headquarters fixed communications facilities
- * incompatibility in frequency between combatting authorities' radio circuits
- * lack of pre-planned alternate communications circuits
- * use of inexperienced operators
- * uncertainty of the established command and control links and absence of centralised co-ordination

Rear link Communications

8. By rear-link I mean to focus on the State/Territory/

Commonwealth and of the counter-disaster response and specifically on our National Emergency Operations Centre (NEOC) in Canberra. As the only authorised co-ordinating authority for Commonwealth response to State/Territory requests for disaster relief, NDO through the NEOC is vitally concerned with the maintenance of an efficient communications system.

9. During the pre-disaster phase a co-ordination headquarters, such as the NEOC, is concerned with receiving situation reports on the impending disaster in order to:

- * keep the politicians briefed
- * alert Commonwealth departments likely to be involved
- * alert other States/Territories
- * activate an appropriate counter-disaster plan.

Much the same requirements would apply, to varying degrees, in State/Territory Emergency Service or Counter Disaster Headquarters.

10. To achieve the above, the NEOC uses:

- * telephone
- * telex
- * facsimile

11. When the disaster strikes, the NEOC's role expands to allow for:

- * responses to requests for Commonwealth assistance
- * reception, collation, control and dissemination of offers of assistance
- * activation and management of the National Registration and Inquiry System (NRIS)

Again, the medium used is the Telecom land line/microwave system for our telex, facsimile and telephone traffic.

12. The transition from disaster to post-disaster phase is a rather grey area and recent experience has shown that the NEOC by virtue of its existence and experience, is likely to remain involved with post-disaster requests and with the ever-present requirement to brief the politicians.

40.

13. Examples of typical problems here are:

- * inability to contact the disaster area direct, owing to the loss of Telecom facilities in that area
- * inability to contact SES/TES HQ owing to jammed switchboards and the absence of any priority user system
- * sluggish information flow from the State/Territory concerned, due to overloaded circuits
- * conflicting situation reports, at least in the earlier phases of a disaster, due to confused or non-existent command, control and co-ordination arrangements.

14. Some typical problems in disaster communications in Canada highlighted at their 1982 Communications Seminar included:

- * loss by fire of complete local line and radio communications links
- * technical problems due to human error/unfamiliarity
- * lack of awareness of available communications facilities
- * conflicting local/regional authority directions on communications systems useage
- * jammed telephone systems
- * radio system incompatibility.

Summing up

15. Summing up, counter disaster communications experiences have illustrated and highlighted:

- * incompatibility problems in radio systems
- * inadequate capacity in land line/microwave telephone/telex networks and exchanges and/or the absence of a priority user plan
- * lack of awareness of available communications systems and hence no common user plan

- * confusion, resulting in multipath repetitious transmission and reception of traffic, because of the absence of a simple, agreed command, control and co-ordination policy.

CD COMMUNICATION REQUIREMENTS

by

Mr Robin Herron, Natural Disasters Organization

Gentlemen, what I originally intended to do and may still succeed in achieving is not so much to discuss in ten minutes communication requirements, which is a pretty daunting task, but to try to summarise the highlights of the last day and a half.

We've all sat through a very detailed, yet concise, analysis primarily of the Commonwealth facilities and primarily Telecom, AUSSAT, OTC, and a very blunt look, if you like, at some of the things that might be able to be done in the scenarios. Now what we don't want to do is to zero in on those scenarios for the subsequent work. The scenarios were dreamt up to make people think and address a particular situation that could occur and see just how we'd cope with it. To that end, the work that's been done particularly by John McPhee and by the RFM people and indeed by everyone else, has been very valuable. Equally, we asked (some may say unfairly - it's true it was a daunting task), we deliberately asked the States and Territories concerned to give us very detailed position papers. The position papers that you now have in the back of your folders vary from extremely detailed to general. Now don't be daunted by the fact that some may be general: the people concerned are here and when we get into syndicate discussion feel free to inter-relate between syndicates. If you haven't got someone in your syndicate who can answer a particular question on a particular issue, borrow him from another syndicate and get the information you need. There's no competition involved; the aim of the exercise is success so a completely free interchange between syndicates is what we want.

We are about to embark on the most important phase where we want you to really put your collective heads together. I said yesterday at the beginning and I re-emphasize it now that it's terribly important that collectively and individually we forget who we are. When you get into syndicate if you've got particular expertise in a particular field, that's why you're there. It's difficult, but try to make yourself remote from your normal job except where that job has a direct bearing on the task of the syndicate.

Now running briefly through the presentations that we've had, let me highlight some points that I saw (and there are bound to be many others):

The Telecom charter and the absence of references to disaster. Now Bob McKinnon admitted that there was no indication within the Charter of any obligation in terms of disaster. One of the recommendations, in fact para 29.3 of the 1976 Seminar report which is the last piece of

paper of the not too bulky report in your folder said and I quote, "Because of its special and wide ranging importance the counter-disaster role of Telecom Australia should be formally defined by the Australian Government wherever this has not already been done." So think about that.

Department of Aviation, Department of Transport, Industry and Commerce (Customs) communications. It would have been nice to have Barry McIver, Kell Duncan and James Lee describe briefly what they have, because they too have wide-ranging communication facilities. It's not possible, but they're here so, use them.

Media briefings - Alan Durham highlighted the congestion that arose internationally, never mind nationally - in the Ash Wednesday fires. It's vital, both within the States and Territories and in the Commonwealth, that we have pre-planned bulletins and procedures for bulletins that get out as soon as the disaster occurs. There's no time to try and respond when disaster strikes; by the time we're ready to respond the switchboards are jammed and we've got a situation that we can't communicate with each other.

Access to OTC stations - here again we come back to the problem of co-ordination and control.

Telecom diversity - Noel mentioned the fact that on the East Coast we've got a good range of diversity; in the West, North-West and the North we haven't - food for thought for the future.

Radio access - mobile radio telephones into the telephone network - again, a possible future role.

I think probably that the overall message that I'm getting and I hope that I'm not going off at a tangent - is that with all the help in the world within Australia to resolve the communication problem there is stacks of capacity, there is stacks of equipment, there's a fair amount of redundancy and diversity, all that's required again is coordination and it's that coordination and co-operation which has to be achieved within an established command and control system, whether we like it or not, and the authority with that system must also have the legislative backing, otherwise there's a very grave danger of inter-departmental, inter-authority rivalries, and the lack of prior co-ordination and pre-planning and we get the sort of problems that we have had in the past.

John McPhee mentioned, at the end of his discussion, the communications module. We experienced this approach to problems with the COSMOS 1402 incident in January when there was a possibility of the US nuclear emergency search team (NEST) coming, one of the things they bring with them

wherever they go throughout the world is their own communications module. They literally dump it into the back of a C141 Starlifter and they roll it out the other end, put the antenna up; they've got their own generating equipment and away they go, world-wide. I'm not suggesting this is something every State and Territory wants or needs, but the module approach is another topic for thought and discussion in syndicate.

Now some of the personal views that I'll give you now may or may not impinge on what you're going to do in the next day and a half. I want to look briefly at personnel, very briefly at control, very briefly at the R F Spectrum, telephone/telex facsimile, data links and media.

General Latchford said at the beginning, and it's been re-emphasised as we go through, the single most important issue for consideration is the man, or the woman as the case may be. However complex the system, the system will not solve your personnel problems. Operator training is an issue that we mustn't treat lightly, particularly where those concerned are volunteers and that's the commonest situation when we get into a big disaster. Community reactions to disasters have and will continue to, wreck any plans we may have dreamt up beforehand and therefore your operators really have to be chosen for their ability to innovate and interpret as much as for their technical skills. Technical skills with respect to technicians don't really matter as far as the operator is concerned; as long as he knows how to change frequency and how to operate the set, that's what we're interested in. What he must have is the ability to talk to others and understand what he is doing. Operator inter-operability is equally important because we've got ourselves into a dreadful mess where we've got so many differing frequencies, so many differing types of equipment that it's got to the stage where to be sure of communications, if you've got a team, say, from the Police going in to help a team from the Fire Brigade, to make certain that they can communicate, the Police take their own communications personnel in with them. Now let's hope that in the future we don't face that and our long-range future planning should be directed towards a common system, I believe.

There's a very great advantage in briefing your operators, and particularly with volunteers because your briefing serves two important purposes: it ensures that the high morale that they must have to be volunteers in the first place is maintained, and it encourages their suggestions for communication improvements based on their personal experience of the area in which they live and work.

The other important value from briefing is that it

improves your system performance because if you directly involve your operator in the purpose behind this task, he'll do a better job. I know I'm preaching to the converted in most cases, but its worth re-emphasising.

Command, control and co-ordination have been mentioned again, and again and again - it is something we've got to come to grips with. It's no good saying the problem will go away, we'll solve it by being nice, we've got to have a tight organisation. I'm not suggesting that we want to set up El Supremos in each State or Territory, there are too many problems associated with that, what I'm saying is that even in the Ash Wednesday situation it was very apparent to us at the national level, the time it took (understandably because of the organisations concerned) to get the co-ordinated reports flowing. It happened eventually, but it took time. Really what we should be looking at, and I suggest we should be considering, is that statutory authorities and departments concerned should be co-ordinated and controlled in a disaster scenario by one central body with the authority to do it. In some cases that already exists.

The spectrum. With all due respects to the RFM Branch, I suggest to you that in very general terms we have squandered our use of the existing spectrum. There are problems arising and they've already arisen, particularly in the maritime area, with the multiplicity of small boat users. We've heard from Peter Taylor the problems in Sydney with trying to reallocate frequencies. What we've got to try to ensure, again in the long-term, is that we don't make the same mistakes again.

Telephones - should Telecom for example, be looking at an independent emergency telephone network available only to the counter-disaster fraternity, with its own mobile switchboard, guaranteed access, etc etc, earmarked and stockpiled units? Nice thought, but the overriding criteria throughout all our discussions must be cost, who's going to pay, and we're going to have to justify it.

Telex and facsimile - much the same arguments and questions can be posed for the telex network as for the telephones. Should we be demanding a dedicated on-call emergency network from Telecom? How secure is the system from industrial anarchy, and I'm not getting at the unions in that at all, but it's an element for consideration that we've got to think about because with the move in technology into more and more automation we may find, and I may be painting too black a picture, we may find ourselves in the situation that it's so automatic that if we do have an industrial problem on our hands at the time, that it's literally impossible to get the system back into operation.

Where does the facsimile fit into future disaster communications?

Data links - we've heard Telecom's future intentions in this area, we know that collectively everyone's moving into computer usage. In NDO we're convinced of the need for automation. It will enable us to coordinate our requirements in a disaster and know what's happening. All sorts of problems will arise and have already arisen in the Defence Force; formatted messages; the software required for message routing has got to be the same for everybody, otherwise, as someone said to me, it took him twenty-four hours to get a message because he was on the tailend of the address list. If you put the wrong address list into the computer it spits it out again, it doesn't get transmitted. We want something that will enable us to input, store and instantly recall requests for assistance, with real-time information and a progress report. We want to be able to interface with facsimile for the display and transmission of maps, charts and diagrams. Maybe we should be looking in the future at mobile computer terminals to be air-lifted or carried in to the disaster area or adjacent to it. All of this will require data links both intra and interstate as the State and Territory and Commonwealth capacity develops. There's also a requirement for Telecom in that sense to afford priority, it's all part and parcel of the emergency commitment that becomes the responsibility of one particular authority.

Please enter the discussions with an open mind. If there are any questions don't hesitate to ask them and we look forward with a lot of confidence to some very interesting presentations and solutions.

DEFENCE COMMUNICATIONS SUPPORT

by

Major F. Twining, Department of Defence

In presenting an overview of what type of communications support would be available from defence resources in the three scenarios given, there are some fundamental matters that must be brought to your attention.

Firstly - Defence Force Aid can only be given in emergencies to the civil community if it is requested from an official source. The greater the aid sought, the higher the official source must be. There are basically two categories of aid given by the defence forces in natural disaster situations. These can be summarized as either local, or commonwealth aid. At the local level, an authorized official may request defence force assistance from a local commander of an element of the defence forces. This would equate to the Mayor or Shire President of a town requesting defence assistance from a local military source. For example, the Mayor of Cairns may request the commanding officer of HMAS Cairns to provide sailors to assist in flood control sandbagging. Based on his judgement the commanding officer HMAS Cairns would agree or refuse the request. This type of aid is rather intimate in that the defence forces used would probably be in the same emergency conditions as their civil neighbours and it is not expensive in terms of resources. It also reflects the localised aspect of defence force aid.

In the case of the Mayor of Cairns requesting assistance from say a military commander in Townsville, the situation from a defence view is somewhat different. Assistance in this case is not local, involves reasonable movement, larger forces, logistic support and the rest. In this case a senior military commander must make the decision and any such request must be supported by the appropriate state government authorities.

Where a large amount of defence assistance is requested, or defence resources must be provided from interstate, commonwealth approval is required. Approval must be given by the Minister of Defence, following a formal request from the state body authorised to seek such assistance. All such requests from a defence viewpoint would be co-ordinated through the Natural Disasters Organisation.

It should go without saying that in any case where human life is at immediate risk, a military commander at any level, may make use of any resource under his command to save lives without reference to any higher authority.

Although this process may seem slightly complicated we in the Defence Forces are assisted by the old adage that bad news travels fastest. In most cases, State and Commonwealth

authorities are pleasantly surprised to find out that defence elements are already geared up to react to the emergency, mainly through seeing the inevitable coming. I would add also, that the procedures for requesting defence force aid are well known to all State and Commonwealth authorities involved in counter disaster matters.

The second point is something that bitter experience has taught us. That is, that defence force personnel remain under defence command at all times. The simple analogy is that you do not climb aboard a commercial or even military aircraft, no matter who you are, and tell the pilot how to fly the aircraft. The defence forces will accept and undertake tasks to the best of their ability at the request of the appropriate civil authority, but will remain under military control at all times.

Lastly, we are a finite resource. We only have so many assets, and those assets are located to best meet defence needs. We do not have squadrons of helicopters in every state, and we certainly do not have instant mobile communications elements scattered around Australia.

In general terms what communications do the defence forces have? A quick look at any state telephone directory would seem to disprove my point on the finiteness of defence communications. Under all three services you will find listed such things as communications states, communications centres, transmitting stations, receiving stations, telecommunications or signal units. This can be misleading as I will illustrate:

Defence communications assets are of two types:

Firstly strategic - those fixed resources that provide our long haul networks inter and sometimes intra state and overseas. These elements make up the defence communications network or what is known as defcommnet.

All these elements are fixed: That is the assets are housed in buildings or on real estate. The only thing mobile about them are the personnel. State telephone directory entries consist mainly of these defence communications elements. Some grand sounding titles can in reality turn out to be six men and the odd stray dog.

Secondly tactical communications - these elements consist of the highly mobile defence communications resources. These are primarily located by grouping in Queensland, Victoria and New South Wales. Other states have some defence tactical communications assets but their capability is limited. It is from these tactical resources that the bulk of defence communications support for natural disasters will come.

As the greatest disaster is war. The defence forces should be well equipped to deal with natural disasters. Our combat equipment is mobile, quickly brought into action and ruggedised. It ought to be, as it costs lots of the taxpayers money.

Turning now to the problem the scenario's confront us with. Rather than treat each scenario separately I will list our assets available, viable and moveable, whilst considering possible applications and limitations. I would stress from the outset that we would be in a natural disaster situation and not a resource decision maker.

Our first problem in all three scenarios is getting the resource to the scene. In this, all resource providers have the same problem. Floods present major problems in that not only is the disaster area affected, but also access routes leading to the area. To overcome this problem defence elements would probably form an air head short of the disaster area and use medium and utility helicopters to move forward equipment and personnel. I would add that a lot of that taxpayers money went on ensuring that our equipment can be moved by air. You can sling a defence landrover under a Chinook helicopter but do not expect the same for its civilian counterpart. Naturally other forms of movement such as road, rail, sea and over the shore transport would be utilised to the maximum. The bushfire problem in Victoria and the earthquake in Adelaide also present movement problems, but not to the same extent as does flooding.

In any natural disaster situation information and reaction are the keys. Initial defence reaction would be local where available, state level then at the commonwealth level. Restricting myself to communications aspects. In Cairns we would lose our naval communications station resource to a combination of floods and wind. One patrol boat might remain serviceable, but for scenario reasons we will declare no defence communications assets remaining operational in Cairns. In Victoria under a bushfire situation, the fire protection given to defence communications facilities indicates that we would be well off in terms of strategic and tactical communications survivability, and it would just be a matter of deploying and using the tactical communications resources available. In Adelaide we would lose all internal city fixed communications but retain a substantial interstate telegraph capacity through RAAF Edinburgh. Low level single channel radio assets would be available locally from RAAF Edinburgh and Woodside Army Barracks, in approximately three hours of the disaster, to meet urgent communications tasks.

Prior information flow would be reasonable in terms of the Cairns cyclone, reasonably good in the Victorian bushfire scenario and non existent in terms of a sudden earthquake in Adelaide. In considering reaction timings, a defence force alert would have been issued on a priority basis to all defence units in Townsville bringing them to 8 hours notice to move for cyclone relief tasks. This notice would normally be given independently of any requests for assistance and would be based on the senior military commanders assessment of information concerning the path and velocity of the cyclone. The decision on when to issue the alert would be influenced by the cyclone alert state issued by the Queensland State Emergency Service. In addition selected defence force units in Brisbane could be brought to a 12 or 24 hours alert stage. As further information was received, the degree of alert would be either maintained, increased or reduced. It would be possible that by the time a cyclone hit Cairns, elements of the defence forces would be ready to react at very short notice.

In Victoria selected defence units would be on alert ranging from 30 minutes to 2 hours, with other units at a lower degree of notice. Additional units in NSW and QLD to support the Victorian situation would be on alert ranging from 8 to 24 hours.

In Adelaide with no prior knowledge of the event, it would be a case of using whatever local defence assets that could be made available. As mentioned this would consist of low level single channel radio support from RAAF Edinburgh and 16 air defence regiment at Woodside. A special reaction communications team however, could be air moved from Melbourne within 6 hours of the disaster. This team would have the capacity to provide a short haul radio network of six stations over single channel voice radio military circuits. One duplex telegraph circuit, to most probably the Australian defence force command centre in Canberra, could also be provided by the team.

Having said that we have both a finite resource and good reaction capability, all that is required are decisions on what use to make of the resource. This decision making process is probably the crux of all disaster related issues.

If I can relate quickly back to the Cairns flood scenario and illustrate my point. As previously stated our naval communications station was rendered inoperative by flood and wind. Once this fact is recognized by defence authorities, measures, including the commitment of our scarce tactical communications resources would be put in hand to restore the facility to an operable level. In this context the defence forces would be viewed correctly as looking after defence interests.

A decision to commit defence resources to such a task would be made only after all other requests for assistance had been evaluated. If however, there were no other requests for assistance known to defence authorities, then a commitment to resolving the Cairns naval communications problem would be made. If after committing defence communications assets to this task, a request is received to provide communications assistance to the civil authority in Cairns, then the request may not be able to be met with the same response time as one would expect. The reasons for this are simple, equipment and manpower allotted to the first task may not be capable of performing a different one. As you can appreciate, it is one thing to set out and install a teleprinter only to arrive and find that the requirements has changed to a telephone.

In other words, warning and decisions on what is required must be made in a reasonable time frame. I am certain that many of the assembled gathering can tell of instances where they have kept resources on standby for a long period and after receiving no requests for assistance, have released the resource for other tasks only to find it is wanted immediately. In other words a lack of information flow.

Given that, in terms of the scenarios a decision to use the defence forces for communications support is made, what tasks and type of support are they best utilised for? I see the following as examples of what could be provided:

Provision of a mid to long haul link from the disaster area to a nominated state and or commonwealth authority in a capital city. The link would be, at least initially, a duplex teleprinter circuit that could be transmission protected if sensitive messages were to be passed on it. In time the link could be upgraded to provide additional teleprinter circuits by the deployment of additional manpower and equipment. The initial customer is seen as the disaster area controller, with others being added in time. Equipment and operators at both ends of the circuit would be provided by the defence forces. A prerequisite would be that messages requiring transmission would have to be in written form.

A long haul teleprinter link, along the same guidelines to the first mentioned link, could also be provided from any point in Australia, or its overseas territories to any organization linked directly, or indirectly into the defence communications network. Indirect links in this context would include state crisis centres, or state emergency service headquarters. One such link would be available very quickly with others to follow. The main customer

would be a state or commonwealth authority. For example, in the Adelaide scenario this link could be used exclusively between the Natural Disasters Organisation in Canberra and the South Australian Disaster Co-ordinator, no matter where he was located. Once again the defence forces would supply and man both ends of the circuit.

Short haul single channel voice circuits could be provided within the disaster area on a net, or station to station basis as required. The only limiting factor as to numbers would be the degree of notice for prior movement each was on. In some cases terrain may restrict employment, particularly with elements equipped with only VHF equipment. Naturally, we would prefer all elements to be dual equipped with HF and VHF equipment so that communications could be maintained no matter what the terrain. The defence forces would man and operate the equipment, although we would prefer end users to do the actual talking in view of the verbal nature of such systems. The main customer would be local disaster authorities. It is possible that if other elements of the defence force were involved in relief operations, some equipment of this nature would have to be reserved for their exclusive use.

One service the defence forces can provide that is often forgotten about, is the provision of local line laying and switchboard facilities. Using tactical cable that has a good water resistance and high tensile strength, it would be possible to restore essential telephone systems over short distances of up to 5 kilometres. The main customer is viewed as Telecom, in accord with local disaster authority justification.

Finally the heavy element. Provision of a 24 voice channel radio relay system that could be capable of employment in gapfiller roles over distances of up to 100 kilometres in reasonable terrain. The main customer for this type of service is viewed as either Telecom, the Australian Broadcasting Corporation, or a commercial radio station, or a combination of all three. A number of such systems could be deployed, the only limiting factor being the number of repeaters, or down the hill links being required, versus the total number of equipments. Unless specifically placed on standby for an emergency situation these assets would not be available for at least 24 hours.

Before proceeding further I should give some guidance as to the distance nomenclature I have been using. Short haul in military terms would equate up to 100 kilometres, mid haul between 100 and 1000 kilometres and long haul anything above that.

Before concluding I would like to bring to your attention some facts on military communications equipment:

All equipment is self contained in terms of its overall package. That is, it comes with its own generating equipment, fuel supply and associated bits and pieces. Normally the manpower to operate the equipment will be self sufficient in terms of accommodation and rations. Naturally some resupply of essential items will have to be provided, but not at least for 24 hours. For resupply the goods go to the element and never the vice versa, as any organic communications transport carries the main equipment.

Defence communications equipment, with the exception of high frequency equipment, operates in the military frequency bands using the appropriate modulation for its military employment. It is unlikely to be compatible with commercial equipment. This sometimes can prove to be a penalty and at others a blessing.

Our equipment is purchased with several factors involved, one being in built emission control by limiting its power output. For instance, our manportable VHF equipment has a power output of only 1 watt. Do not expect miracles in terms of terrain coverage from it.

Most of our equipment has been around for a very long time. It is old and it shows it. Despite our excellent technical support, age has wearied components to the point where it is impossible to predict what will go wrong next. Often installing a new component creates fault in another. We will have equipment failures and therefore to ensure serviceability it will be necessary to keep operable equipment in reserve. We will not normally commit this reserve equipment to general tasks unless there is the strongest justification, as to do so, would place established circuits in jeopardy.

To conclude I would like to re-emphasise that in terms of communications, the defence force would be a resource supplier. To make the best use of the resource, due consideration needs to be made of it's attributes and limitations. We as professional communicators should also not forget that history repeats itself - remember it was not too many years ago that the communications of bad news were immediately put to death by the recipients. In this day and age, the stock excuse for problems is that communications were bad. As long as the providers of communications do not communicate amongst themselves, then we bring upon ourselves, communications problems. I for one, would like to see an operation where our masters had to look at areas other than communications, as the cause of their problems. I see this study period as going a long way in re-establishing communications and look forward to assisting you in any way I can.

AUSTRALIAN COUNTER-DISASTER COLLEGEMT MACEDON, 24 - 27 JULY 1983BROADCASTS AND EMERGENCY BROADCASTING

by

Mr D. Kelly, Broadcasting Division, Department of
Communications

I should like to commence with an outline of the functions of the Department's Broadcasting Division and its role and relationship with other Commonwealth statutory authorities involved in broadcasting.

The Division provides advice to the Minister on matters relating to the development of policies on radio and television broadcasting services. The Division also provides advice on matters concerning the planning, commissioning and operation of broadcasting stations, particularly in regard to the Minister's responsibilities under the Broadcasting and Television Act 1942. The Division establishes technical policies and plans for the development of broadcasting systems in Australia, and sets and oversees technical standards and practices to be observed by broadcasting stations.

The Department is also responsible for providing the transmitting stations used by the ABC and SBS (Special Broadcasting Service) to broadcast their programs. Telecom's Broadcasting Branch acts as an agent or contractor to the Department for the actual construction of these stations. The ABC and SBS provide their own studios where their programs are produced. Generally, Telecom links are hired to relay these programs around Australia. This is not universal however, a notable exception being the use of the Intelsat IVA satellite to relay ABC television programs to some stations in remote areas. Australia's national satellite, scheduled for 1985, will have a far reaching effect on the distribution of ABC programs as it is intended that it be used to relay programs to a large number of stations which presently receive them via Telecom land-links or other means. The impact of this will have to be taken into account in the near future, in planning for disasters.

I would now like to make some general points with regard to broadcasting in disaster situations, then address the

specific scenarios depicted for this Study Group.

Broadcasting, in a disaster, offers the unique capability of communicating up to date emergency information directly to the affected community as a whole.

Radio-communication systems and telephones, by their nature, provide 2 way links between limited number of individuals of small groups, often at fixed locations. Hand-portables and mobile units offer added flexibility. These systems can facilitate communication between members of disaster control bodies in the disaster zone, and also between counter-disaster authorities and external points. Broadcasting being a unidirectional medium, cannot replace these networks but it can provide the vital link between authorities and the public.

The Broadcasting and Television Act provides for 4 main classes of broadcasting viz Commercial and Public, which are licensed; and ABC and Special Broadcasting Service (or the National Sector). Most of us are probably familiar with commercial and ABC services but I would like to take this opportunity to say a few words about public and special stations. Public stations are licensed to operate for "special purpose" in an "educational", "special interest", or "community" category to supplement and complement commercial and ABC programs. Many public stations offer broadcasts in languages other than English and would be able to disseminate emergency information to a variety of ethnic communities. At present public broadcasting is confined to sound radio. Because of the limited availability of medium-frequency channels, most operate in the FM band. The Public Broadcasting Association of Australia is the national representative of public stations.

The Special Broadcasting Service (SBS) is an independent statutory authority established under the Broadcasting and Television Act 1942, which provides multilingual radio and television services. At present radio programs are broadcast on medium-frequency stations in Sydney, Melbourne, Newcastle and Wollongong. Television programs are transmitted in Sydney and Melbourne and more stations are planned. A number of public stations receive subsidy assistance from the SBS for production and transmission of community language programs. SBS stations broadcast "community service" announcements and run "community information" campaigns in an extensive range of non-English languages for the benefit of ethnic community audiences. The stations have a capacity to disseminate emergency information to these communities.

To round off on some statistics, in Australia there are 246 medium-frequency radio stations (142 commercial, 95 ABC, 5

public, 4 SBS), 65 FM radio stations (7 commercial, 25 ABC, 33 public), 451 television stations (171 commercial, 275 ABC, 5 SBS), and in addition 6 HF inland services operated by the ABC.

Details of all services can be obtained from the Department's publication "Sound and Television Broadcasting Stations".

Of the various modes of broadcasting, medium-frequency radio is potentially the most valuable in disasters. However television and FM radio have a role to play.

There are several reasons for the superiority of medium-frequency broadcasting. The proliferation of modern transistorised MF receivers in Australian homes has virtually eliminated listeners dependence on mains-power and external aerials, both of which are likely to be disabled in a disaster. Also, because of their exceptional portability these radios may be carried about the disaster area quite readily without losing contact. Reception is also possible using car radios. A further advantage is that the studio facilities required for emergency transmissions are minimal.

On the other hand, television reception may well be lost during the impact phase because it is generally dependent on the survival of mains-power and an external antenna. The receiver itself is also susceptible to damage. Furthermore, television transmitters tend to be located on mountains or hills remote from the communities they serve. They are vulnerable to damage by cyclones, fires and perhaps earthquakes. They would often be safe from flooding, although the same might not be said for their studios. In the event of damage to the transmitters, repairs are likely to be delayed because of the relative inaccessibility of the site. Fairly complex studio facilities are also required, even for emergency broadcasts. However, because television tends to attract substantial audiences, particularly in the evenings, it can be effective in disseminating warnings and information about approaching disasters. It can also be useful in educating residents in disaster prone areas, on a continuing basis, towards greater disaster awareness.

FM broadcasting has advantages offered by the availability of portable transistorised radios although there would be fewer of them than for MF. However, it generally suffers from the same disadvantages as television in relation to transmitter siting. Furthermore, at present there are relatively few FM services throughout

Australia, particularly in less densely populated disaster prone areas. This is illustrated by the fact that there are currently no commercial FM services outside capital cities (although there are some public stations). Penetration of FM transmission can also be affected by obstacles such as buildings, particularly in city areas.

Commercial medium-frequency stations are especially well suited to the counter-disaster role. Operators are eager to assist and have a proven record of participation. The local commercial station tends to be a focus of community interest. Station management is often involved in community affairs and is in many cases represented on the local counter-disaster body. Being local, management is able to respond quickly to requests from counter-disaster authorities, in changing situations.

ABC stations are also available, however there is less flexibility with them because of networking, with most programs originating in capital cities and only a small proportion at relatively few regional studios. Controlling authorities also tend to be centralised. ABC stations are generally spaced further apart than commercials, but often have higher power providing wider coverage. This characteristic can be advantageous for disaster planning. It should be added that in order to provide more programs of local interest, to meet government policy commitments regionalisation of ABC services is being considered. As this progresses, programming and perhaps management of stations will become increasingly decentralised. There are, however, high capital and operational costs involved and any program for regionalisation is likely to be spread over many years.

Public and SBS stations would be available too, although there are relatively few of them and a number are low powered with limited coverage. They also tend to be concentrated in capital and major cities.

It is important that messages broadcast before, during and following the disaster's impact are accurate, relevant and above all, timely. The reporting of a disaster's progress and its effects, is recognised as an important news reporting role of the media. However it is the availability of authoritative information and directions to residents actually in the danger area that will enable them to take preventative action or perhaps to evacuate the area if this is called for. The provision of such emergency information for dissemination by broadcasters is at the discretion of counter-disaster authorities. Its accuracy, relevance and timeliness will depend on the ability of these authorities to monitor the developing situation using two-way communication networks within and external to the disaster zone, and the availability of communication links to broadcasting stations.

In the post-impact phase broadcasting stations can be of considerable assistance to authorities in rehabilitative activities, for example to inform affected residents of resources which are available to them, or on the whereabouts of other people. Psychological comfort provided by radio broadcasts to communities under stress can also be valuable.

Some comments on physical aspects of medium-frequency stations might be useful at this point.

The main components of a station comprise a studio, a transmitter and a line to relay programs from the former to the latter. Power is required at the studio and at the transmitter. Commercial stations tend to have a local studio and transmitter with a relatively short program line (hired from Telecom). ABC transmitters are in many cases quite distant from the nearest studio and are connected to it via a long program link. Whether these facilities survive depends upon the nature of the disaster and the vulnerability of each in terms of location and design, including the availability of standby equipment. In circumstances where the studio or program line fails but the transmitter (including aerial) survives, it would often be possible to make broadcasts in a limited form, direct from the transmitter site.

Special arrangements already exist for the operation of ABC transmitters when program input had been disrupted. It has been mentioned that although some programs are generated in regional studios the majority originate in capital cities. Programs from the capital cities and regional studios are usually relayed around the country via Telecom land-links over the same routes as telephone bearers. Input to the transmitter itself is provided by means of a special program line from the local telephone exchange (in the form of underground cable or open wires). If program input to an ABC station is lost because of link failure and no alternative relay is available, emergency broadcasts can be made using temporary program generating equipment, from the telephone exchange. If the line to the transmitter is disrupted, transmissions could then be made directly from the transmitter site. Emergency broadcasts would be made by an officer of the ABC, or if one is not available, a specially authorised counter-disaster officer.

In planning for disasters, station management would need to develop detailed procedures to deal with various circumstances which may arise. Regular checks on emergency equipment, facilities and stores as well as simulated exercises would also be necessary.

Periodic assessment of the station's physical vulnerability to likely disaster scenarios in consultation with counter-disaster authorities, would indicate weaknesses requiring corrective action.

Ideally, stations would be sited and built to withstand the likely worst case disaster for their locality. But of course it is not possible to plan against every contingency and emergency plans need to be drawn up by counter-disaster authorities on the assumption that not all broadcasting services survive. As well as including local radio stations in plans, authorities would need to consider whether other stations can be received in the area. These may be some distance away but could be utilised in the event that local stations are disabled. An assessment would be required to determine whether the relative disposition and design of these other stations is such that at least one is likely to survive in various types of disaster. For example, an alternative station sited on the coast is likely to suffer damage in a cyclone whereas an inland one may not. The plans also need to provide for temporary or permanent emergency communications links to the studios and transmitters of local and alternative stations so that messages may be relayed to them for broadcasting.

Broadcasting services cannot form an effective part of plans for a region unless their coverage is known. Coverage, for reception of emergency messages, does not imply the quality of reception obtained from local stations in normal circumstances. Quite noisy reception can be tolerated. Estimation of emergency coverage is quite difficult because of the number of variable factors involved. Curves can be drawn on a map to represent the nominal limits for intelligible emergency reception in daylight hours using an average quality receiver. However in good conditions, using better quality receivers, coverage can extend considerably. On the other hand, at night coverage may be reduced due to fading and interference from other stations. It is important to realise also, that man-made electrical noise generated in larger cities will affect reception in the daytime and nighttime. Even in our own homes, turning on a fluorescent light, light dimmer or food-mixer can obliterate reception of distant stations. Electrical interference during periods of thunderstorm activity will also affect reception. Intelligibility can often be improved by repeating messages frequently. The Department is able to assist authorities in predicting coverage which might be achieved in various circumstances.

Clearly the simplest method of determining which stations other than local ones can be received reliably in particular towns, is for local authorities to arrange listening tests or consult residents. Any assessments would need to be conducted in day time and at night over sufficiently long periods to establish reliability.

In recognition of the potential of broadcasting in disasters, the Department has a transportable emergency broadcasting station (TEBS) which is held specifically for deployment to the scene of a disaster where local stations have been disabled. Pending restoration of the local services this station can be used to broadcast emergency messages and rehabilitative information. It can be rapidly transported to a disaster at short notice to transmit on any frequency in the medium frequency band. To assist the public in tuning their receivers to the emergency station it would normally operate on the same frequency as an inoperative station it replaces. Emergency coverage would be provided for at least 15-20 km.

This station is unique in that it is fully self-contained but broken down into component modules and packed into boxes ready for transportation to the disaster area. It may be carried, together with technicians, in any one of a variety of defence force or commercial aircraft, including helicopters. Upon reaching its destination it can be unpacked, re-assembled and brought into operation within hours.

The division of responsibilities for deployment and operation of the TEBS is outlined in a document which has been agreed to by the individual members of the Emergency Broadcasting Committee and by the Committee itself. A copy of the document is included as an Attachment to this paper.

Briefly, the division of responsibilities is as follows:

The NDO is responsible for processing of requests for, and arranging authorisation of, deployment of the TEBS to the disaster area. The relevant State or Territory counter disaster authority is responsible to NDO for operational control of the station in the area of deployment, including making arrangements with local ABC and/or commercial operators for the provision of announcers and program material, and authorising announcements relating to instructions to the community affected by the disaster.

The Department of Communications is responsible for advising the Minister for Communications on activation of the TEBS, and for allocation of a frequency if other than pre-existing station frequencies are required.

Telecom is responsible, on behalf of the Department of Communications, for accepting and responding directly to requests from NDO for deployment of the station, for storage and maintenance when not in use, and for providing two technicians to set up and operate the station in the area of deployment.

A second transportable station, permanently housed in a caravan is also available. Apart from its physical construction this station is similar to the first. However because of its size, transportation requires a C130 Hercules. It too can be made operational within a short time of arriving at its destination.

These emergency stations would invariably operate from a different site to the local station being replaced. Some form of emergency communication link may need to be established to relay information to it from the local counter-disaster operations centre.

Each station has already been used effectively in exercises but to date not a disaster situation.

The introduction of the national satellite may present the opportunity in a disaster, for improved communication between authorities at the disaster scene and external agencies via a transportable satellite terminal.

I would now like to discuss the 3 disaster scenarios being considered by this Study Group. This will not be an attempt to provide complete solutions to the problems which would arise, but rather to indicate what those problems might be. It is expected that solutions would be considered during syndicate discussions and later in more detail by counter-disaster authorities. Material to be provided by later speakers in relation to provision of two way communication links, should be of considerable assistance. Because in general, medium-frequency broadcasting offers advantages over other modes, discussion will concentrate on that type of station.

The first situation involves a severe cyclone and 5 metre storm tide in Cairns, disabling communications within the storm tide contour. (Refer Fig 1.). A map of the region is attached to this paper.

Primary medium-frequency broadcasting services in Cairns are provided by commercial station 4CA and ABC station 4QY.

It could be expected that warning of the impending cyclone would be broadcast to Cairns residents by the local radio stations as well as by ABC television station ABNQ9 and commercial station FNQ-10. Reference has already been made to the advantages of medium-frequency broadcasting during the impact and post-impact phases and consideration is now given to those periods.

The studio for the commercial station and the ABC's regional studio for the area are located in city buildings. Station 4CA's transmitter is on low lying land at Bessie Point, some 5km across the harbour. Base levels of the equipment

building and masts are elevated above the ground to avoid flood damage, but cyclone damage is still possible. Programs are relayed to the transmitter by UHF link from the city studio.

4QY's transmitter is located between Edmonton and Gordonvale, some 15km south of Cairns, on land which is 20 metres above mean sea level. Its program line from Cairns runs underground in gas-pressurized cable.

In the defined scenario, 4QY's transmitter, being outside the 5 metre storm tide contour, would be the only local broadcasting facility to survive. With the loss of its program input, emergency transmissions could be re-established directly from the transmitter site, using the standby generator to provide power. The effectiveness of this arrangement would depend on a temporary communications link being provided by counter-disaster authorities, to relay messages from Cairns, for subsequent broadcasting.

Should both local stations be totally disabled, pending their restoration a number of others in the region would be capable of providing, in varying degrees, emergency coverage of Cairns. These include commercial stations 4AM Mareeba and 4KZ Innisfail, and ABC stations 4AT Atherton, 4MS Mossman and 4QN Townsville. Reliable communications links would need to be available from Cairns to each of the stations to be used. It should be appreciated that the program lines for ABC stations 4AT and 4MS pass through Cairns and in the present scenario could be expected to sustain flood damage. Transmissions directly from their respective transmitters may, however be practical.

A convenient yet strategically located alternative providing a reasonably strong signal in Cairns is station 4AM. Its studio and transmitter are at Mareeba, on a plateau some 30km west of Cairns. Because of the rapidly diminishing intensity of a cyclone moving inland, its facilities could be expected to survive. Nevertheless a variety of equipment back-up arrangements are incorporated in the station's design. In addition, a communications line has been installed between the studio and Mareeba's counter-disaster emergency operations centre.

Emergency information could be relayed from Cairns to Mareeba using a link arranged by counter-disaster authorities. VHF communication is known to be possible from about half of the Cairns area and use of HF is also feasible.

The next situation to be considered is a series of earthquakes in Adelaide disrupting communications within 20km of the city centre. A map of the region is attached to this paper (Refer to Fig 2).

Primary medium-frequency broadcasting services in Adelaide are provided by ABC stations 5AN and 5CL, and commercial stations 5DN, 5AD, 5KA and 5AA. Service is also obtained from public station 5UV.

Studios for these stations are either in the central business district or within a distance of 5km to the north. Transmitters for the commercial station's and the public station are all inside the defined 20km damage radius, however those for the ABC stations are co-sited at Pimpala, just outside this zone.

In the current scenario it would have to be assumed that only the ABC transmitters survive intact. As in the case of Cairns, it would be possible to broadcast directly from the transmitter site, using standby generating equipment to replace disrupted mains power. Reliable communications would need to be provided by counter-disaster authorities to relay messages from the point chosen by them as a temporary emergency operations centre. Assuming this to be in Adelaide, it is likely that an HF link would be appropriate whereas the intervening hills would preclude use of VHF or UHF systems.

Should all local stations be disabled, ABC station 5CK Port Pirie has the capacity to provide good emergency coverage of Adelaide. Port Pirie's commercial station 5PI could also be utilised although its signal-strength is somewhat lower. Transmitters for both stations are at Crystal Brook while their studios are in Port Pirie.

It would of course be necessary to provide a communications link from Adelaide to Port Pirie. The form this should take requires detailed consideration and may depend on circumstances at the time. However, counter-disaster authorities would need to consider preparation of appropriate contingency plans for such a link.

The third scenario involves major bushfires in Victoria with a breakdown in fixed communications between Melbourne and the affected areas, and problems with mobile communications.

Medium-frequency coverage in Victoria is provided by 23 commercial stations (8 metropolitan, 15 regional) 7 ABC stations (2 metropolitan, 5 regional) and 1 metropolitan SBS station. Some cover very wide areas. For example ABC stations 3AR and 3LO Melbourne and 3WV Horsham have 50 kilowatt transmitters and can each be received over more than half of the state. Commercial stations and the SBS station are lower powered and designed to provide more localized service. The attached map shows the location of each studio and transmitter together with the program line between them (Refer Fig 3). It can be seen that

each commercial and the SBS station has its own studio, but the only ABC studios outside Melbourne are at Horsham, Sale, and Albury (NSW). Local program lines are all fairly short, mostly of the order 10-15 km but with some up to 50 km. The majority of the ABC programs originate in Melbourne or are routed through Melbourne from other States. They are distributed via Telecom-land-links, which are also shown on the map. Programs from Horsham and Albury may be fed to any distant ABC stations via Melbourne. Programs produced in Sale can be fed to Omeo.

The accompanying map gives an idea of the emergency coverage provided (Refer Fig 4.) Locations in the large unshaded area generally receive at least 1 commercial and 1 ABC station in addition to any local ones. On the other hand, the dashed area in East Gippsland is not covered at all. This region is sparsely populated but it does contain a number of towns including Mallacoota, Cann River and Corryong.

The hatched areas in between are generally served by either 1 or 2 ABC stations, as shown.

Mallacoota, Cann River and Corryong have television translator stations but as mentioned earlier television has limitations in disaster situations.

The boundaries shown on this map should be interpreted as nominal outer limits of emergency coverage. However, this is not to say that distant stations cannot be received anywhere in the dashed area. Furthermore, as indicated earlier, reception within the boundaries can be affected by a variety of factors, particularly in large cities. Predictions need to be checked by conducting listening tests or consulting residents in each major town. This will identify which stations in addition to local ones can be received reliably in the daytime and at night. Contingency plans then need to make provision for emergency communications links to appropriate alternative stations. It should be noted that some stations, particularly ABC ones, can be quite distant from locations they cover.

In the scenario depicted, it is not possible to speculate which stations, if any, would be disabled. None are known to have been affected in the recent bushfires. Nevertheless a few general observations can be made. Studios are located within towns and are probably as vulnerable as other buildings and homes. Transmitters and their aerial masts are normally on cleared land outside towns, but could be damaged. Local program lines, being mostly underground, should be relatively safe. Most transmitters and a majority of studios have emergency generators in case of mains power failure. Distribution links for ABC programs are incorporated

in broadband bearers which are in the form of coaxial cable or microwave radio systems. The vulnerability of these will no doubt be referred to by other speakers.

To summarise, apart from East Gippsland, emergency coverage from medium-frequency stations is probably adequate and alternatives should be available in situations where local stations are disabled. This does, however, require verification by counter-disaster authorities as part of their contingency planning. Should it not be the case in all locations, the transportable station would be available, however it should be remembered that its coverage is limited. Consideration might also be given to its use in East Gippsland. Most homes would have a radio on which residents attempt to listen to the best service available (even though it may be poor). To be effective however, residents would need to be made aware of the deployment and the frequency on which it would operate.

Before concluding I would like to emphasise that in order to capitalise on the potential of broadcasting, detailed plans need to be formulated in advance by counter-disaster authorities. One issue that stands out clearly is the need for emergency communication links to be incorporated in those plans. Because of the complexity of the broadcasting system it is strongly recommended that plans be drawn up in consultation with the State Offices of the Department, Telecom, the ABC and the SBS together with commercial and public station managements. It will of course be necessary to review plans regularly to take account of any changes in the broadcasting system.

MEDIUM FREQUENCY STATIONS PROVIDING EMERGENCY BROADCASTING COVERAGE IN CAIRNS

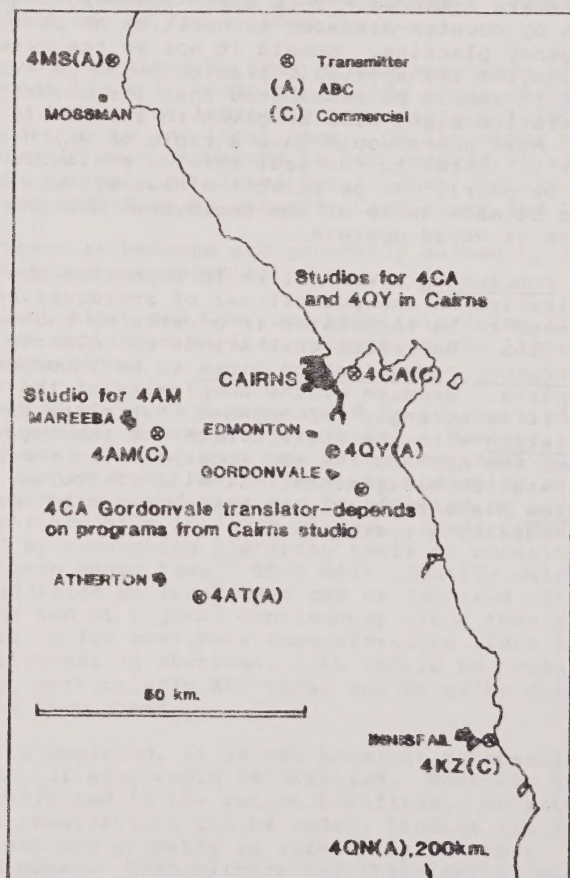


FIGURE 1

MEDIUM FREQUENCY STATIONS PROVIDING EMERGENCY BROADCASTING COVERAGE IN ADELAIDE

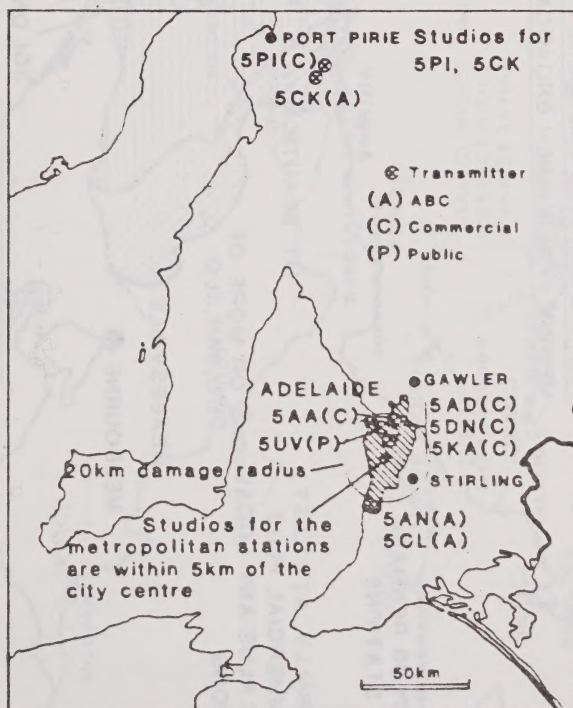


FIGURE 2

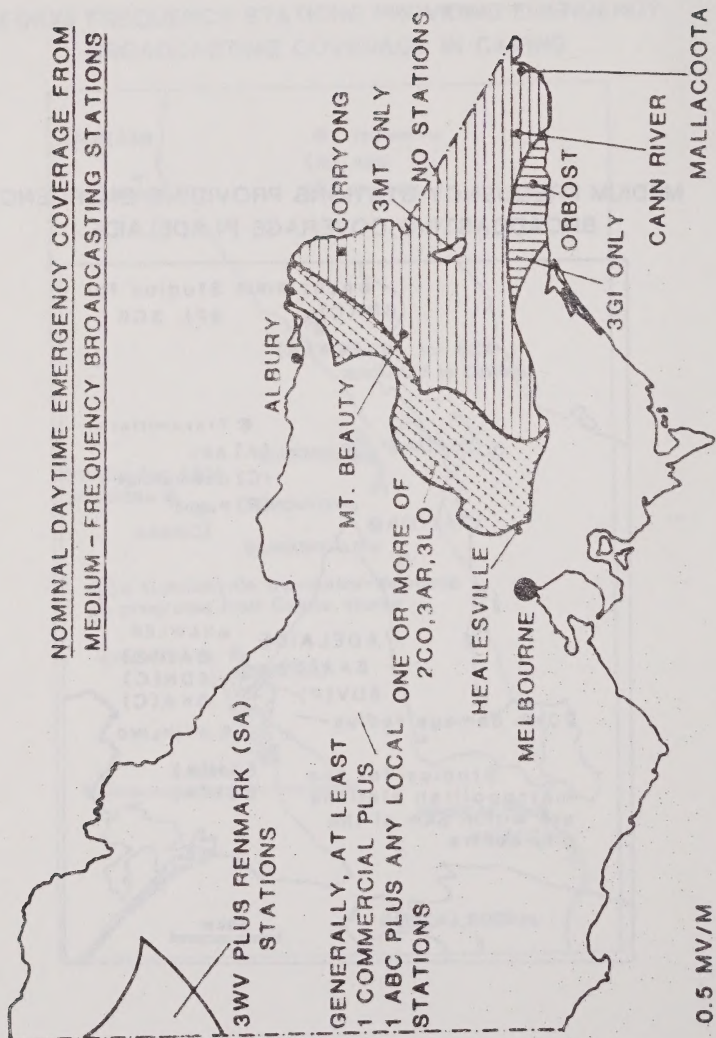


FIGURE 3

STATIONS PROVIDING MEDIUM-FREQUENCY EMERGENCY BROADCASTING

COVERAGE IN VICTORIA

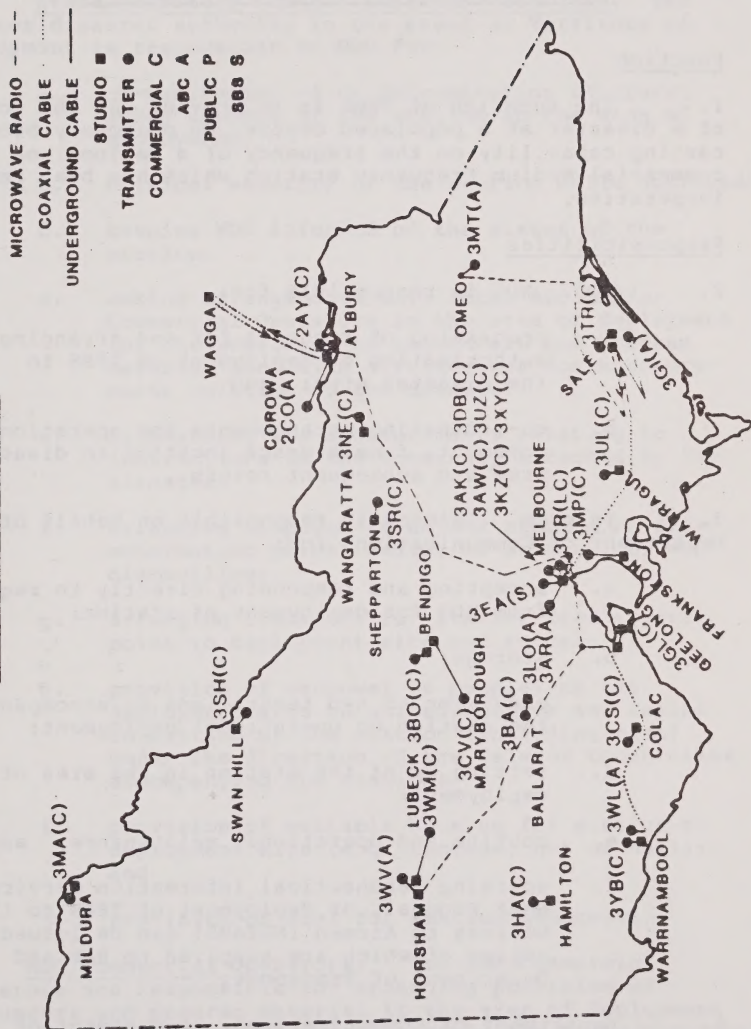


FIGURE 4

DIVISION OF RESPONSIBILITIES FOR TRANSPORTABLEEMERGENCY BROADCASTING STATION (TEBS)A DEPARTMENT OF COMMUNICATIONS RESOURCEFunction

1. The function of TEBS is to provide, at the location of a disaster at a populated centre, an emergency broadcasting capability on the frequency of a national or commercial Medium Frequency station which has been rendered inoperative.

Responsibilities

2. NDO. NDO is responsible for:

- a. processing of requests for and arranging authorisation of deployment of TEBS to the disaster area; and
- b. co-ordinating arrangements for operational movement, from storage location to disaster area and subsequent return.

3. Telecom. Telecom is responsible on behalf of Department of Communications for:

- a. accepting and responding directly to requests from NDO for deployment of station;
- b. storage;
- c. provision of two technicians to accompany the station on operational deployment;
- d. setting up of the station in the area of deployment;
- e. routine and operational maintenance; and
- f. advising Aeronautical Information Service, RAAF Frognal, of deployment of TEBS so that Notices to Airmen (NOTAMS) can be issued, copies of which are supplied to RAN and Department of Transport.

4. Department of Communications. Department of Communications is responsible for:

- a. frequency clearances if other than pre-existing station frequencies are required; and
- b. advice to Minister for Communications on activation of TEBS.

5. State/Territory Counter Disaster Authority. The counter disaster authority in the State or Territory of deployment is responsible to NDO for:

- a. co-ordination of or determination of operational control of the station in the area of deployment;
- b. physical security of the station while deployed;
- c. keeping NDO informed of the status of the station;
- d. making arrangements with local ABC and/or Commercial Operators in the area of deployment for the provision of announcers and program material including arrangements for announcements relating to the disaster;
- e. authorising all announcements relating to instructions to the community affected by the disaster;
- f. arranging manpower to unload station at disembarkation point, assist in setting up, and dismantling;
- g. arranging transport for station from arrival point to deployment site and return;
- h. provision of manpower (6 people) at the deployment site to unload, unpack and assist in setting up the station (including mast) under the direction of the Telecom technicians accompanying the station;
- i. provision of suitable housing for station at deployment site (e.g. tentage, hut or hall); and
- j. provision of fuel for station generator.

6. ABC/Commercial Operators. The ABC/Commercial Operators are responsible for arranging provision of announcers and program material in the area of deployment under arrangements to be co-ordinated by the State/Territory counter disaster authority.

7. Arrangements for Dismantling and Return of TEBS. These arrangements would normally be made at the time as part of on-going arrangements during the rehabilitation phase of the disaster.

8. Indemnification. As Telecom personnel will accompany the station during the post disaster phase, it will not normally be necessary for the affected State or Territory to indemnify the Commonwealth against loss or damage. However, if the station is retained during the rehabilitation phase, the need for indemnification will be assessed at the time.

9. Exercise Deployments. The foregoing divisions of responsibility are also applicable to exercise deployments.

AUSSAT PTY. LTD.PRESENTATION FOR COUNTER-DISASTER COMMUNICATIONS STUDYMACEDON25TH JULY 1983

by Mr D Kennedy, Systems Manager, AUSSAT Pty Ltd

EXECUTIVE SUMMARYINTRODUCTION

This Business Overview details the background, development and current status of the Australian satellite system and the Company which will own and manage that system - AUSSAT Pty Ltd. The Overview highlights the extensive consultative process which formed the basis of the satellite's design and the continuing liaison AUSSAT has initiated and maintained with potential users of the satellite to ensure the system accommodates the diverse requirements of the Australian community. Details are provided on the arrangements for the system's launch and equipment contracts together with a full technical description of how the satellite system will operate. In particular the Overview details the types of services that AUSSAT will provide and examines the implications for new employment opportunities of AUSSAT's technology transfer and Australian content.

AUSSAT PTY. LTD.

AUSSAT Pty Ltd is a company limited by shares and incorporated during November 1981 to own and operate the Australian national satellite system. The Company is managed by a Board of 13 Directors including a Chairman and Deputy Chairman of Directors. The Chief Executive Officer is the General Manager. AUSSAT completed the tender evaluation for the satellite system and during May 1982 executed contracts with Hughes Communications International of the United States for the supply of three identical satellites and associated ground control facilities. AUSSAT has arranged with NASA to launch Australia's first two satellites during July and October 1985.

AN AGENT FOR CHANGE

AUSSAT will be a catalyst for fundamental change in the Australian telecommunications scene. The launch of AUSSAT will be one of the most significant events in Australia's development of telecommunications. For the first time every part of Australia will be covered by a comprehensive telecommunications system which will complement, diversify and expand existing communication facilities. The satellite design is the culmination of some four years of consultation with potential users and will provide communication services for those isolated communities and homesteads which have no services, widen services available to underserved

communities, upgrade and extend the communications network operated by the Department of Aviation, provide the means for the development of a dynamic and imaginative approach to broadcasting and generally expand and diversify communication services available in major population areas and large cities throughout Australia.

AUSTRALIAN CONTENT & EMPLOYMENT

A central objective of the Australian satellite program has been active participation of Australian industry in the design and manufacture of the satellite system and to achieve high technology transfer to Australia. The AUSSAT project has been designed to ensure the creation of high technology employment opportunities in areas such as spacecraft design, manufacture and operation, earth station design and construction, particularly in export related small earth station manufacture, together with employment opportunities in sophisticated computer software development and advanced electronics generally. Additionally, AUSSAT will award substantial contracts to the Australian building industry for the construction of earth station buildings throughout Australia.

FINANCE

The capital cost of the satellite system, that is the supply of three satellites and ground control equipment, the launch of two satellites plus insurance will be \$166M. Other capital costs for which AUSSAT is responsible, including equipment sites and buildings for the major earth stations, will increase this total to \$225M.

AUSSAT is financed by equity capital (initially wholly subscribed by the Commonwealth) and bridging loans to cover capital pre-operational costs in the period leading up to the commencement of commercial operations in 1985. The authorised share capital of the Company is \$100M divided into 100 million shares of \$1 each.

The bridging loans totalling \$350M were negotiated on the Company's behalf by the Commonwealth Trading Bank of Australia and Manufacturer's Hanover, London, and will continue if necessary until December 1985. These loans will be replaced by longer term financing now under development.

AUSSAT's capital expenditures are mostly denominated in foreign currencies. To safeguard the Company against adverse alterations in exchange rates between those currencies and the Australian dollar, AUSSAT has entered into foreign currency hedge contracts to ensure the Company's foreign currency exposures are protected.

BUSINESS OUTLOOK

Effective and continuing liaison with potential users has ensured the development of a commercially viable satellite enterprise based upon realistic and reasonable costs which will serve the interests of the nation and which will also generate sufficient return on investments to fund the Company's current and future capital and operational expenditures.

March 1983

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BUSINESS OVERVIEW

A CORPORATE AND TECHNICAL APPRECIATION

BACKGROUND

Since the early 1960's, following the advent of communication satellites; Australian communication authorities have closely followed the development of satellite technology and its possible application to the Australian domestic communication network. Following consideration of an unsolicited proposal from the owners and operators of television stations Channel 9 in Sydney and Melbourne during 1977 the Commonwealth Government established an inter-departmental Task Force to examine the feasibility of establishing an Australian satellite system. Following its evaluation of the Task Force report which recommended the establishment of a satellite system, together with other associated reports the Commonwealth Government announced in October 1979 its decision in principle to proceed with an Australian satellite system.

Detailed work then commenced on the design of a satellite system which would cater for the diverse needs of the Australian community. Recognising its unique experience in Australia in the planning and operation of the international INTELSAT satellite system, OTC released its Assistant General Manager Mr W. G. Gosewinckel and its Planning Director Mr R. C. Johnson to lead a specially selected OTC team to develop the Australian satellite system's technical specifications. This OTC team later formed the nucleus of the staff of AUSSAT Pty. Ltd.: the eventual owner and operator of the Australian satellite system. Mr Gosewinckel and Mr Johnson, who both participated in the original Task Force investigation, later became AUSSAT Pty Ltd's General Manager and Deputy General Manager respectively.

CONSULTATION

The establishment of Australia's communications satellite system has significant and wide ranging implications for remote area communities, the Australian telecommunications industry, commercial and public broadcasters, a wide spectrum of potential public and private sector users and the Australian business community in general. The development of a satellite system design which reflected the requirements of this diverse range of potential users was achieved through a program of active participation and consultation between satellite planners and potential satellite users. Appendix 1 details the organisations consulted during the design process and is indicative of public involvement and participation in the satellite project.

The final system design was embodied in tender specifications released in the form of a Request for Tender during October 1980. The RFT was developed following extensive consultation with Commonwealth Government Departments, State Governments, community groups and a large number of potential satellite users including the ABC, OTC, Telecom, Transport Australia, commercial television operators, business and data users and a variety of miscellaneous minor users. Special attention was devoted to the particular and unique communications requirements of remote rural communities and homesteads and to those users whose requirements would influence the technical design of the satellite system. Appendix 2 examines the implications for Government communications policy of a number of satellite system design features and identifies important related policy issues for AUSSAT.

In addition to this consultative and inter-active process continuous contact was maintained with aerospace and earth station manufacturers. This continuing industry involvement in the satellite planning and design work included a three day Briefing for Industry for satellite and earth station manufacturers which was held in Sydney during April 1980. Over 200 representatives from some 80 organisations from Australia and overseas were present at this Briefing which was essentially designed to preview the RFT. All satellite manufacturers were represented and the opportunity was used to have private discussions with a number of leading Australian and overseas tenderers. Almost half the organisations present at the Briefing were Australian firms. By gaining maximum exposure to the satellite design manufacturers were able to maximise the Australian content provisions in their response to the system's technical specifications.

REQUEST FOR TENDER

In accordance with the Government's decision, the RFT was released for worldwide distribution on 30 October 1980 and comprised eight volumes totalling some 2200 pages.

RFT documents describing their respective earth station requirements were prepared by Telecom, Transport Australia and the then Postal and Telecommunications Department. Although each element of the RFT is a free standing document OTC issued a consolidated RFT on behalf of all these organisations at the request of the Government.

The OTC team led by Mr Gosewinckel and Mr Johnson accepted responsibility for preparation of RFT documents relating to the space segment, including earth tracking and monitoring (TTC&M) stations, major city 'gateway' earth stations and minor users' earth stations. A detailed appreciation of the technical specifications for the total satellite system appears on Page 91 together with a brief introduction to the subject of satellite communications for the non technical reader.

SATELLITE SERVICES

The launch of the satellite system will be one of the most significant events in Australia's development of telecommunications. For the first time every part of Australia will be covered by a comprehensive telecommunications system which will complement, diversify and expand Australia's telecommunications facilities.

AUSSAT staff engaged during the design of the satellite system have actively participated in a wide ranging program of consultation and dialogue with potential users to ensure the development of an Australian satellite system which will cater for the requirements of a diverse range of satellite users and which will serve the interests of the entire Australian community.

The satellite system will have the potential to provide:

- * telephony and other telecommunications services to the remote areas of Australia which cannot reasonably expect to receive such services;
- * a range of services for the national broadcasting system (ABC) and for commercial and other public sector users including television and radio relay and accordingly increase the choice for significant sections of the Australian community;
- * aeronautical, maritime and land based transport communications for the Department of Aviation permitting effective and efficient use of aircraft and transport movements throughout Australia;
- * radio and television services for remote and underserved areas; and
- * data, facsimile, videotex and other services for the Australian business community which will permit greater use and development of information processing to enable the business sector to respond to changing circumstances and make maximum use of available resources.

In essence the satellite system will significantly improve the overall flexibility, reliability and capacity of the Australian national communications network to respond to rapidly changing circumstances and to accommodate the special requirements of particular users and community groups. Through the provision of distance independent technology and a highly adaptable design, AUSSAT will permit the development of progressive and innovative broadcasting applications and accordingly dramatically widen programming potential.

AUSSAT PTY LTD FORMATION

Following the world wide release of the satellite system's technical specifications OTC, through its team led by Mr Gosewinckel, accepted interim ownership and management of the system and its major city earth stations pending the formation of AUSSAT Pty Ltd on 6 November 1981. Ownership and management of the satellite system then passed from OTC to AUSSAT. AUSSAT is a proprietary company limited by shares with the Commonwealth of Australia as the sole beneficial shareholder.

The Company's primary objective is to carry on a business of operating a national telecommunications system for Australia, or for Australia and neighbouring regions, by the use of satellites. AUSSAT's Memorandum of Association directs the Company to operate on a non-discriminatory basis, set fair and equitable charges and to conduct its affairs as efficiently and economically as possible in accordance with the normal commercial practices for a tax paying enterprise.

In addition to owning and operating the space segment and the associated ground control facilities, AUSSAT will also own and operate major "gateway" earth stations in each capital city including Darwin and Canberra. These multi-purpose earth stations will provide national access to the system for those users who elect not to purchase their own earth stations.

The current AUSSAT Board comprises thirteen Directors (including a Chairman and Deputy Chairman of Directors). Brief background details of each Director and AUSSAT's Chief Executive appear below.

Deputy Chairman: Dr. D.D. Brown AO BSc, PhD, of Sydney, previously Deputy General Manager and Director of CSR Limited until his retirement in 1980. Presently Chairman of the Electricity Commission of NSW, member of the National Energy Research Development and Demonstration Council and a Director of several companies.

Mr H.S. Cottee of Sydney, Company Director. Commissioner of the Overseas Telecommunications Commission (Australia) and Chairman and Director of several companies.

Mr J.J. D'Arcy B.Com. of Brisbane, Accountant. Deputy General Manager of Queensland Newspapers Pty Limited, Group Finance Director Queensland Press Limited. Director Herald and Weekly Times Ltd.

Mr T.H. Farrell of Sydney. Assistant General Manager of John Fairfax Ltd until his retirement in 1983 and a Director of several companies.

Mr J.F. Gleeson of Townsville, Chairman of Telecasters North Queensland Limited Group and a Director of several companies.

Mr R.M. Graham B.E. (Chem), MBA of Sydney, Group General Manager and a Director of Consolidated Press Holdings Limited and a Director of several companies.

Professor M.W. Gunn B.Sc., M.Sc., Ph.D. of Brisbane, Dean of the Faculty of Engineering, University of Queensland.

Mr D.B. Horgan of Perth, Chartered Accountant. Chairman of Barrack House Group Pty Limited. Former Chairman and Chief Executive of Metro Industries Limited.

Mr E.E. Payne* LL.B of Canberra. Deputy Secretary Department of Communications and a Commissioner of Overseas Telecommunications Commission (Australia).

Mr R.H. Searby QC of Melbourne, Barrister-at-Law.
Chairman of the News Corporation and a Director of
several companies.

Mr R.H. Treweeke LL.B. of New Angledool (near Walgett),
Grazier and Federal President of the Isolated
Children's Parents Association.

Mr R.F. Wiesener MBA of Sydney. Chartered Accountant
and Company Director. Joint Managing Director of
Aviation Developments Pty Limited.

- * Mr R.B. Lansdown, Secretary, Department of Communic-
ations is an alternate Director for Mr E.E. Payne.

Chief Executive Officer & General Manager

Mr W.G. Gosewinckel ARMIT, MIE Aust., FMIREE (Aust.)
of Sydney, Communications Engineer. Formerly Senior
Assistant General Manager, Overseas Telecommunications
Commission (Australia).

The Board generally meets at least monthly and has
established an effective sub-committee system to facilitate
early resolution of specific and significant issues.

AWARD OF CONTRACTS

Since AUSSAT's incorporation on 6 November 1981 the
Company has awarded the following communications equipment
and service contracts :

May 1982: a Spacecraft Purchase Agreement with
Hughes Communications International Inc of the United
States for the supply of three of the satellites and
associated ground control facilities;

- * October 1982: a Launch Services Agreement with
the National Aeronautics and Space Administration
(NASA) of the United States for the launch of two
AUSSAT satellites on the Space Shuttle during July
and October 1985;

- * October 1982: an earth station contract with Mitsubishi Australia Ltd for the supply of eight major city "gateway" earth stations to be owned and operated by AUSSAT in each capital city in Australia including Darwin and Canberra; and
- * February 1983: earth station contracts with Codan Pty Ltd of Adelaide, Mitsubishi Australia Ltd of Sydney and Sumitomo Australia Ltd of Sydney for the supply from each organisation of seven minor earth stations. These earth stations will be used to conduct technical trials and on site demonstrations for potential users of the satellite system.

Additionally, AUSSAT has engaged a number of building consultants to provide assistance with the design and construction of AUSSAT's earth station buildings and to assist with the acquisition of suitable earth station sites throughout Australia.

The timetable of activity leading up to the commencement of system operations is detailed on page 101.

LAUNCH VEHICLE

Although contractual relationships to build the first generation of the Australian Satellite System were entered into during May 1982 it had been necessary prior to that date to make a number of commitments associated with the launch of the satellites. These commitments involved the payment of launch reservation deposits totalling \$US400,000 divided equally between the two launch agencies: NASA of the USA and ARIANESPACE of Europe. Those two agencies provide the Space Shuttle and ARIANE launch vehicles respectively. This expenditure was incurred during 1980 and 1981 in order to secure a number of launch options for the Australian satellite during 1985. These payments were seen as being commercially prudent as they permitted AUSSAT maximum flexibility in selecting the preferred launch vehicle and assured the Company of launch dates during 1985.

Following some two years of investigation and analysis AUSSAT resolved to select the Space Shuttle orbitor supplied by NASA of the United States as the preferred launch vehicle for the Australian satellite System. AUSSAT has contracted with NASA to launch the first two AUSSAT satellites during July and October 1985.

Although assured of Shuttle launch dates during July and October 1985, AUSSAT is deliberately maintaining spacecraft compatibility with ARIANE launcher to retain maximum flexibility in selecting the launch vehicle for AUSSAT's third spacecraft. That selection is likely to be made during 1985 and will be based upon then current pricing and operational factors. Depending upon demand for satellite capacity and other requirements, the third spacecraft is expected to be launched during 1988.

AUSTRALIAN CONTENT

A central objective of the Australian satellite program has been active participation of Australian industry in the design and manufacture of the satellite system and to achieve high technology transfer to Australia. The AUSSAT project has been designed to ensure the creation of high technology employment opportunities in areas such as spacecraft design, manufacture, and operation, earth station design and construction, particularly in export related small earth station manufacture, together with employment opportunities in sophisticated computer software development and advanced electronics generally.

The Australian Satellite System design and overall technical specifications were prepared by Australian engineers. During the nominal three year construction period of the satellites an AUSSAT engineering and technical support team comprising some ten Australian satellite design specialists will be present at the Hughes' plant to oversight the satellites' construction, launch arrangements and monitor overall system technical performance requirements. In this way the transfer of advanced aerospace technology will commence at an early date and will ensure that there is significantly less reliance on overseas engineering assistance during later generations of AUSSAT satellites.

As mentioned previously, continuous contact was maintained with manufacturers to ensure Australian content was maximised in the satellite program. That fundamental objective was realised. The Hughes organisation, which will manufacture the AUSSAT satellites, will place orders with the Australian firms and will provide high technology transfer to Australia to the order of 30% of the space segment contract value. Through the provision of this technology transfer Australia will gain longer term benefits through the AUSSAT Satellite Program. Additionally, Hughes has contracted with Australian firms to manufacture the AUSSAT satellites' special harness mechanism.

There will be the direct involvement of Australian industry in the manufacture, installation and operation of the earth stations which will access the satellite system. Australian content will account for almost 50% of AUSSAT's earth station contract with Mitsubishi Australia for the supply of the major city earth stations to be located by AUSSAT in each capital city of Australia. This Australian content involves the provision by Australian firms of advanced electronics and antenna fabrication. In addition AWA is participating in the manufacture by Hughes of the vital AUSSAT Tracking Telemetry Control & Monitoring (TTC&M) stations, particularly in the development of sophisticated computer software development. The TTC&M stations to be located in Sydney and Perth, will continuously monitor the performance of the Company's orbiting satellites. The Sydney station will also accommodate the Satellite Control and Operations Centre.

Contracts awarded by AUSSAT for the supply of minor earth stations from Codan, Mitsubishi and Sumitomo are a tangible and effective method of stimulating the development within Australia of manufacturing sources of small earth stations and offers the potential of generating export sales in the rapidly developing field of earth station use.

In summary, AUSSAT will generate new high technology employment opportunities in areas such as spacecraft design manufacture and operation, earth station design and construction together with unique employment opportunities in sophisticated software development and advanced electronics generally.

AUSSAT CAPITAL WORKS: STATUS

There is every prospect that the Hughes organisation will have AUSSAT's first spacecraft ready for delivery before the contracted delivery date of February 1985. AUSSAT's residential program team located at the Hughes Los Angeles construction plant is working with Hughes' personnel on early problem diagnosis and rectification. No major construction problems have been encountered or are foreseen by the Company. Shuttle launch dates of July and October 1985 are assured by NASA and no difficulties are foreseen in this area.

The earth station production schedule calls for Mitsubishi to commence construction of the Major City Earth Stations during mid 1983 and to begin equipment installation of the Sydney and Perth stations during May 1984. The remaining earth stations will be progressively installed in other capital cities during the period leading up to the commencement of satellite operations during 1985. This aspect of the satellite program is also on schedule. Further, a number of suitable earth station sites have been identified by AUSSAT in capital cities. All is now on schedule for a mid 1985 launch and the commencement of satellite operations during the second half of 1985.

STAFFING

The progress of the project during the past three years represents a significant engineering design and logistic effort. The Company currently employs some fifty individuals who comprise a committed team of professionals including physicists, mathematicians, scientists, spacecraft engineers, payload and communication specialists, economists, accountants and administrative staff together with specialists in communications project management. Based upon the experience of other domestic satellite owners, AUSSAT's staff will number approximately 200 at time of launch during 1985 the majority of whom will tend to be well qualified technical and engineering specialists. A significant number of AUSSAT's staff have acquired over ten years of satellite system design experience with some being directly involved in the design and operation of the global satellite system since its inception during the mid 1960's.

AUSSAT's staff are employed under traditional commercial sector employment conditions as the Company is structured and operates as a commercial company rather than a Commonwealth Statutory Authority. Staff contribute to an AUSSAT Superannuation Fund rather than the Commonwealth Superannuation Scheme (CSS) owing to the significantly higher level of contributions and financial commitment required by employing authorities under the CSS arrangements. Staff do not have security of tenure, and receive leave and other employment conditions which accord with normal private sector practices.

CONSULTANCIES

AUSSAT has engaged a number of technical, legal, financial and general management consultants to assist the Company's management and which have enabled AUSSAT to be established as a fully independent corporate entity. The firms selected for this work have been :

Accounting	:	Arthur Young & Company
Legal	:	Freehill Hollingdale and Page
Technical	:	Telesat Canada
Public Relations	:	Eric White Associates, Darcy Farrell & Associates
Remuneration & Superannuation	:	Cullen Egan Dell Australia Pty Ltd

CONVERSION TO A PUBLIC COMPANY

At present AUSSAT Pty Ltd's sole beneficial shareholder is the Commonwealth of Australia. As part of the Company's objects, as detailed in its Memorandum of Association, AUSSAT is to convert, as soon as practicable, to a public company with up to 49% of the issued share

capital owned by persons other than the Commonwealth of Australia or its authorities and to obtain stock exchange listing in Australia.

In announcing its decision to proceed the Government reaffirmed its decision to convert AUSSAT from a wholly Commonwealth owned proprietary company to a publicly listed company.

In consultation with its financial and legal advisors, AUSSAT has been completing the necessary preparatory work on the development of a prospectus. This work is receiving priority and the Company will provide early advice to the Government.

CONCLUSION

Since AUSSAT Pty Ltd was incorporated during November 1981 the Company has :

- * negotiated and executed equipment contracts for the supply of Australia's first domestic satellite system;
- * made arrangements to launch the satellite system during 1985;
- * commenced the procurement of a range of earth stations which have significant Australian manufacturing and advanced electronics content;
- * executed bridging finance arrangements with the Commonwealth Trading Bank of Australia and Manufacturer's Hanover Limited to finance the Company's capital and operating expenditures;
- * posted ten key specialist staff to oversee construction and launch of AUSSAT's spacecraft to ensure early and effective transfer of advanced technology to Australia and ensure AUSSAT's spacecraft are available on schedule;
- * established widespread and continuing liaison with potential users to ensure the satellite system continues to meet the diverse requirements of the Australian community at realistic and reasonable costs; and

- * created new and unique employment opportunities within the Company which will assist in the expansion and development of the Australian telecommunications industry into new and emerging 'high technology' related applications.

In Summary, AUSSAT is confident that the satellite system will be a viable commercial enterprise serving the interests of all Australians.

March 1983
0207a (10A)

BUSINESS OVERVIEW.
APPENDIX I.

GROUPS AND ORGANISATIONS CONSULTED

BROADCASTING AND MEDIA INDUSTRY

Amalgamated Television Services Pty Ltd ('7 Network')
 Federation of Australian Commercial Television Stations
 NBN Channel 3 Newcastle
 News Ltd
 Publishing and Broadcasting Ltd
 Radio Station 4 BH Brisbane
 Southern Television Corporation Adelaide
 United Telecasters Sydney Ltd ('Network 10')

PUBLIC SECTOR

Bureau of Meteorology
 Department of Administrative Services
 Department of Communications
 Department of Defence
 Department of Education
 Department of Science and the Environment
 Department of Transport Australia

Australia Post
 Australian Broadcasting Commission
 Overseas Telecommunications Commission (Australia)
 Telecom Australia

NSW Police
 Office of Regional Administration and the North West
 (Western Australia)
 South Australian Government Departments

GOVERNMENTS

Papua New Guinea
 South Pacific Economic Commission - Suva

DATA USERS

Australian Computer Society
 CETIA
 Computer Operators of Victoria
 Computer Sciences of Australia
 Coopers and Lybrand
 CRA Ltd
 EDP Auditors Association
 Housley Computer
 IBM (Aust) Ltd
 Myer Ltd
 National Library of Australia
 Victorian Association for Library Automation
 DOMSAT Committee for Libraries & Information Services
 Western Mining Corporation

TELECOMMUNICATIONS CONSORTIA & GROUPS

Australian Satellite Users' Group
 Business Telecommunication Services Ltd
 Communication Facilities Ltd
 Institute of Radio & Electronics Engineers
 Telecommunications Society

COMMUNITY GROUPS

Isolated Childrens' Parents' Association

TRADE UNIONS

Administrative & Clerical Officers Association
 Australian Public Service Association (PDO)
 Association of Architects, Engineers, Surveyors and
 Draftsmen of Australia
 Association of Professional Engineers Australia
 Federated Miscellaneous Workers' Union
 Professional Officers' Association
 Professional Radio & Electronics Institute

OTHER GROUPS

AHA College of Hotel Catering
 NSW Justices Association
 Radio Amateurs Old Timers Association
 Townsville College of Advanced Education

THE AUSSAT SATELLITE SYSTEM

A TECHNICAL INTRODUCTION

INTRODUCTION

The purpose of this document is to introduce non-technical readers to the subject of communication satellites, and in particular the Australian communications satellite system - AUSSAT. A brief description is given on how satellites operate, how they are controlled from the ground, their physical characteristics plus the special ground equipment which is necessary in order to establish a satellite based communications network.

HOW AUSSAT WILL WORK

The Australian Satellite System is scheduled to be launched from Cape Canaveral on board NASA's Space Shuttle during July 1985. Following its ejection from the Space Shuttle, at an altitude of about 250kms above the earth, special rocket motors will lift the Australian satellites to their specially chosen orbital positions about 36,000 kilometres above the equator and just to the east of Australia. At this height the satellites will move at the same speed and in the same direction as the earth rotates. As each of their orbits will take 24 hours to complete, the satellites will always remain 'fixed' or 'stationary' when viewed from Australia.

The orbital positions selected for the AUSSAT satellites (156°, 160°, 164° longitude east) will achieve the best overall satellite service for all Australia.

The AUSSAT satellite system will consist initially of two satellites orbiting in space and an on-ground spare which will be launched at a later date. The typical 'life' of each satellite will be 7 years. Each satellite will be capable of receiving radio signals from earth, changing their frequency and retransmitting the amplified signals back to any point in their coverage area. Combinations of receivers, amplifiers and transmitters are known as transponders and each AUSSAT satellite will carry fifteen transponders. Each transponder will be capable of carrying at least one high quality colour television service, several hundred telephone channels or high speed data services.

The coverage area or 'footprint' can be narrowed and concentrated onto relatively small areas within the satellites' field of view. The AUSSAT system has been designed so that its coverage area extends over all of Australia, including surrounding coastal waters and Papua New Guinea to the north of Australia. The satellites will have a national beam and four individual 'spot' beams with one each covering Western Australia, the Northern Territory and South Australia, Queensland and a fourth beam covering the States of New South Wales, Victoria and Tasmania.

The AUSSAT satellites will be controlled from Australia by two special Tracking, Telemetry, Control and Monitoring stations which will be located in Sydney and Perth. These two special tracking stations will maintain complete control and surveillance of the orbiting satellites and will ensure that the satellites' special communications antennas are correctly pointed towards Australia.

THE AUSSAT SATELLITE: SIZE AND SHAPE

The AUSSAT satellite design is based upon the familiar spinning body stabilised satellite of "drum" shape consisting of solar arrays on the exterior of the spinning "drum" with circular communication reflectors mounted to one end of the "drum". The satellites will be 6.6m tall, 2.2m in diameter and will weigh some 655 kgs when deployed in space.

AUSSAT SYSTEM DESIGN

A communications satellite can be used in two ways. In the Fixed Satellite Service Mode the satellite provides a two-way link between two defined points and is used as an alternative to conventional terrestrial microwave or coaxial cable systems. In the Broadcasting Satellite Service Mode programs are received directly by one-way transmission from the satellite into homes or community centres by use of small, relatively inexpensive earth stations located on the users' premises. The AUSSAT satellite system will provide a hybrid capability for Fixed Satellite Services and also a form of broadcasting service known as the Homestead and Community Broadcasting Satellite Service (HACBSS).

EARTH STATIONS

In order to use AUSSAT it will be necessary to have appropriate ground equipment known as earth stations. Individual users of the satellite system will be able to own and operate their own earth stations if they wish. Earth stations use dish-type antennas and vary in size (antenna diameter) and cost depending on their intended application. Some earth stations will be known as "receiver-only" and will do just that - receive signals of radio and television programs directly from the satellite. Studies indicate that as many as 25,000 of these small earth stations will be located across Australia.

Other stations will also transmit signals as well as receive signals and will vary in size and cost depending upon their intended use. Many business and data satellite users will locate earth stations on the roof tops of city buildings around Australia to provide access to the AUSSAT system.

The satellites and their special earth control stations AUSSAT will be owned and operated by AUSSAT Pty Ltd. That Company will also own and operate a network of multiple purpose earth stations to be located in every capital city including Darwin and Canberra. These earth stations will provide national access to the satellite system and provide satellite services to those users who elect not to establish their own earth stations.

PAPUA NEW GUINEA

The Government of Papua New Guinea is considering possible use of the Australian satellite system for services within Papua New Guinea. Types of services which the satellite can provide for that country include a direct broadcasting service similar to HABCSS plus point-to-point telephony and other telecommunication services.

SPACE SEGMENT OVERVIEW

Australia's national communication satellites will be spin stabilised spacecraft, a technique developed by the Hughes Aircraft Company and perfected during more than 20 years of testing and practical application. While the two cylindrical solar panels spin at 50 rpm and provide not only gyroscopic stability, but twice the power of earlier satellites of this type, the antenna assembly remains pointed toward the coverage zone, ensuring continuity of the satellite's communication services.

The unique design of the Hughes satellite permits the spacecraft to be stowed inside the launch vehicle in a configuration that is less than half the overall height of the satellite in orbit. With the antenna folded down and the outer solar panel covering the inner solar panel, the spacecraft is only 2.8 metres high. Once in orbit, the antenna is erected and the outer solar panel extended - like a telescope opening - bringing the overall height to 6.6 metres.

The satellite system will consist initially of two operational satellites and an on-ground spare. The typical 'life' of each satellite will be at least 7 years.

POSITION IN ORBIT

The first two operational satellites will be placed in geostationary orbit approximately 36,000 kilometres above the equator at 156°E longitude and 164°E longitude. The satellites are 2.2 metres in diameter and will weigh about 655 kilograms at the beginning of life in orbit.

Heat generated by the spacecraft's electronics equipment is radiated to space through a quartz mirror thermal radiation band around the middle of the satellite. The solar panels use high-efficiency K-7 solar cells and generate more than 1 kilowatt of power when fully deployed at the beginning of life. Two nickel-cadmium batteries supply full power during eclipse operations and are re-charged by the solar cells.

ANTENNA CONFIGURATION AND CAPACITY

The spacecraft is similar in design to the satellites Hughes is currently building for seven other customers, with one significant difference. While all other spacecraft of this type use a single antenna structure for the transmit and receive signals, each AUSSAT satellite has three separate dual surface antennas, providing

six reflectors in total. In other words, all three antennas are dual polarised; each can form transmission beams in the 12.25 and 12.75 GHz band on both polarisations. The satellite receives signals in the 14.0 and 14.5 GHz band on both polarisations.

The vertically and horizontally polarised signals do not interfere with each other and combined with the three dual polarised antennas permit the satellite to provide total and multiple nationwide and spot beam coverage.

The advantage of using multiple antennas instead of a single antenna is that with a separate reflector surface dedicated to each homestead and community broadcasting satellite service (HACBSS) coverage area, a significant improvement in antenna performance is achieved.

The largest antenna is 112 centimetres in diameter and forms the transmit beams to Central and Western Australia as well as the receive beam for Papua New Guinea. Alongside the largest antenna is a second antenna 102 centimetres in diameter which forms the transmit beams to the North-East and South-East regions of Australia and to Papua New Guinea. The smallest antenna is 61 centimetres wide and is centred below the larger antennas. This antenna provides both the transmit and receive beams for national coverage.

These three antennas are mounted on a common support structure made of a lightweight thermally-stable graphite fibre composite which is deployed once the spacecraft reaches geosynchronous orbit. The entire antenna assembly is gimballed to provide exact positioning.

Pointing accuracy of the antenna system is better than 0.05 degrees. This is achieved by a specially designed radio frequency beacon tracking system carried on board the satellite which locks the antenna system onto a beacon signal transmitted from the ground control station in Sydney. This technique has been used by other Hughes satellites and was pioneered by the earlier ANIK A, PALAPA A and WESTAR satellites.

The spacecraft has 15 channels or transponders, each 45MHz wide. Eight channels use the horizontal polarisation and seven use the vertical polarisation. Four of the channels use 30 watt K-band travelling wave tube amplifiers necessary for the high-power requirements of the homestead and community broadcasting satellite service (HACBSS). The remaining 11 channels use 12 watt travelling wave tube amplifiers.

TRACKING TELEMETRY CONTROL AND MONITORING (TTC&M)

Control of the orbiting satellites will be performed through two TTC&M stations to be located in Sydney and Perth. The satellite Control and Operations Centre (SCOC) will be co-located with the Sydney TTC&M station and will provide full visibility and control of the entire satellite network. The station also provides the up-link beacon for active tracking of the spacecraft antenna system. Identical control functions will be capable of being performed by the Perth TTC&M station.

Orbital control (station keeping) manoeuvres using the satellite's positioning system will be made about every three or four weeks on command from the control stations. Spacecraft attitude (spin axis orientation) adjustments will be made more frequently at around 5-6 day intervals. Communications performance will be monitored by separate equipment at Sydney, Perth, Adelaide and Brisbane.

SUMMARY OF TECHNICAL SPECIFICATIONS

<u>Satellites</u>	*	2 satellites in geostationary orbit, 36,000 kms above equator 156°E longitude, 164°E longitude)
	*	one on-ground spare
	*	mass - initial mass of each satellite 655 kilograms
	*	size - 2.2 metres in diameter 6.6 metres high
	*	service life - minimum 7 years

<u>Launch</u>	*	firm bookings have been made for launch on NASA's Space Shuttle
	*	First two launches due during July and October 1985

<u>Transponder Capacity</u>	*	each satellite will have capacity of 15 transponders - 4 x 30 watts and 11 x 12 watts
	*	30 watt and 12 watt transponder back-up will be available in each satellite in the event of transponder failure
	*	radio frequency power approximately 250 watts

<u>Frequency Bands</u>	*	14.0-14.5 GHz frequency band for <u>uplink transmission</u> (ground to satellite)
	*	12.25-12.75 GHz frequency band for <u>downlink transmission</u> (satellite to ground)

Coverage Areas

- * in uplink direction, each satellite will have two national beams each capable of receiving signals from anywhere within Australia and a spot beam to receive signals from Papua New Guinea
- * in downlink direction, each will have two national beams and four spot beams covering
 - * Western Australian
 - * Queensland
 - * South Australia/Northern Territory
 - * New South Wales/Victoria/Tasmania
- * There is also provision for covering Lord Howe and Norfolk Islands, as well as a spot beam to cover Papua New Guinea

Satellite Control

- * two Tracking, Telemetry, Command and Monitoring Stations (TTC&M) will be installed at Sydney and Perth. The Sydney station will have the Satellite Control and Operations Centre
-

GLOSSARY OF TERMS

<u>fixed satellite service mode:</u>	the satellite provides a two-way link between two defined fixed points. Used as an alternative to conventional terrestrial microwave or coaxial cable systems.
<u>broadcasting satellite service mode:</u>	programs or other material (eg data) are received directly by one-way transmission from the satellite by use of small 'receive-only' earth stations located on the user's premises.
<u>"spin" stabilisation:</u>	the design uses solar panels on the exterior of the spinning "drum"; spinning motion provides gyroscopic stability. Communications antennas remain pointed towards coverage zone.
<u>geostationary orbit</u>	the orbit in which satellite appears
<u>or geosynchronous orbit:</u>	fixed or stationary when viewed from the ground; orbit is circular and in equatorial plane at a height of 35,790 km above earth.
<u>transponder:</u>	the combination of receiver, frequency down-converter and transmit amplifier. Each AUSSAT satellite will carry 15 transponders.
<u>national beam:</u>	the satellite antenna beam designed to cover the whole of Australia.
<u>spot beam:</u>	the satellite antenna beam designed to cover a particular region of Australia.

TTC&M ground stations:

Tracking Telemetry, Command and Monitoring stations which control and monitor satellite in orbit. Two stations - one in Sydney and one in Perth - will control AUSSAT satellites.

earth stations:

ground equipment necessary to communicate through the satellite. Can be "receive only", or transmit and receive. Vary in size (and cost) depending on application.

HACBS:

Homestead and Community Broadcasting Satellite Service designed to transmit radio and television services to remote and underserved areas.

TIMETABLE

October 1979	Government decision in principle to proceed
September 1980	Government decision to issue request for tender (RFT)
October 1980	Issue of request for tender
May 1981	Closing date for tenders
May 1982	Orders placed for spacecraft
October 1982	Orders placed for major earth stations
February 1983	Orders placed for minor earth stations
Early 1983	First earth station sites acquired
July 1985	Launch of first spacecraft
Second half 1985	System Operational
March 1983	
0211a(10A)	

HACBSS AND THE 30 WATT TRANSPONDER:CONCEPT, IMPLEMENTATION, IMPLICATIONS & GOVERNMENT POLICYCONCEPT

The Homestead and Community Broadcasting Satellite Service (HACBSS) is a concept peculiar to the Australian satellite system design. This concept was developed to achieve Government objectives of providing and extending the ABC's sound and television broadcasting to underserved areas of Australia. It is envisaged that the ABC will broadcast its sound and television programs direct via the satellite's HACBSS transponders to remote communities and homesteads. In this application HACBSS is a form of direct broadcasting.

IMPLEMENTATION

Given Government policy of providing and extending radio and television broadcasting to all Australians, decisions were taken in 1980 during the evolution of the conceptual satellite system design to use higher powered transponders (30 watts) to provide the HACBSS service. The motives for the selection of this higher power level were :

- (i) to provide television and sound broadcasting to remote areas of Australia at an affordable cost to the user;
- (ii) to allow antennas that will receive the signal to be simple and robust, relatively small in size (up to 1.5 metres in diameter) and be suitable for installation by an average home handyman; and
- (iii) minimise overall system costs (ie for the satellites plus the earth stations).

IMPLICATIONS

The basic satellite system design calls for two 'in orbit' satellites with one on ground spare satellite. All satellites will be identical in design and performance characteristics, ie each will have 15 transponders (- at approximately 30W and 11 at approximately 12W). Accordingly, there will be eight orbiting HACBSS (30W) transponders, four of which will be used by the ABC.

GOVERNMENT POLICY

The provision of the HACBSS service has formed a fundamental objective of Government communications satellite policy. The development of a satisfactory and reliable service at an affordable cost to individual users has consumed a considerable amount of the overall system design work.

In its role of providing policy advice to Government, the Department of Communications has been exploring a number of service options for Government consideration concerning broadcasting use of the second HACBSS channel. In essence, these options are:

- (a) lease the second HACBSS channel to an existing licensee group for national commercial broadcasting or to four existing licensee groups for broadcasting on a zone by zone basis; or
- (b) as for (a) above but least to a new licensee group or groups; or
- (c) use the second HACBSS channel for special broadcasting development involving all existing broadcasters to provide experimental and developmental basis.

During August 1982 the Government approved a change to the satellite's system design which permitted the 30 watt transponders to be switched from spot beams to the national beam. As a result any 30w transponder switched to the national beam could not be used to provide a HACBSS service.

The availability of 30 watt transponders, at least on the first and second satellites scheduled for launch during 1985, is dependent upon Government decisions regarding the establishment of a second HACBSS service. If there are to be two HACBSS services provided by those satellites then all of the initial complement of eight 30 watt transponders would be allocated to those two services. Accordingly it would not be possible to satisfy any other request for use of 30 watt transponders until the launch of the third AUSSAT spacecraft which, based upon current demand forecasts, is expected to be launched during 1988.

AUSSAT PTY. LTD. AND SATELLITE CAPABILITIESIN COUNTER DISASTER COMMUNICATIONSIntroduction

This paper investigates the role that satellite communication systems provided by AUSSAT PTY. LTD. could play in counter disaster communications. The following topics will be considered :-

- (a) AUSSAT Pty. Ltd.
- (b) Features of satellite communications.
- (c) Services that may be used in counter disaster communications.
- (d) Earth stations.
- (e) The use of satellite facilities in the scenarios:
 - (i) Cyclone at Cairns
 - (ii) Bushfires in Victoria
 - (iii) Earthquake in Adelaide
- (f) System considerations.
- (g) Equipment requirements.

AUSSAT PTY. LTD.

AUSSAT Pty. Ltd. was incorporated in the Australian Capital Territory by the Commonwealth Government on 6 November 1981, with the Commonwealth of Australia as the sole beneficial shareholder. On 6 May 1982, AUSSAT was given formal Government approval to establish and operate the National Satellite System.

In AUSSAT's Memorandum of Association the following provisions appear :

- (i) AUSSAT Pty. Ltd. operate as a commercial enterprise paying taxes and dividends;
- (ii) AUSSAT Pty. Ltd. should be converted to a public company with 49% of its share capital sold to the private sector;
- (iii) Transponder capacity and other services will be made available on a non-discriminatory basis for which fair and equitable tariffs and conditions will apply.

AUSSAT's Earth Stations

AUSSAT will have initially eight Major City Earth Stations (with 13-18 metre diameter antennas). Twenty one single channel customer earth stations with dishes in the range of 2.4 to 4 metres, have been purchased to be used in field trials and market development.

In the case of a disaster situation, AUSSAT would be able to co-operate in the provision of some communications capacity and other resources, but as AUSSAT is a commercial company, this would need to be purchased at non-discriminatory rates. AUSSAT would be pleased to give technical assistance in the establishment and evaluation of network on the satellite system for disaster communications purposes.

The highlights in AUSSAT's future are:

- Mid 1984
Delivery of 21 Customer Earth Stations
- 1st half of 1985
The completion of the 8 Major City Earth Stations
- July 1985
Launch on Shuttle of the first satellite

- October 1985
Launch of the second satellite
- Last Quarter of 1985
Commencement of commercial operations
- 1988
Anticipated launch of 3rd satellite

FEATURES OF A SATELLITE SYSTEM

The satellite system provides the capability for high grade communications between all locations within Australia. To provide the service it is necessary to have the appropriate earth stations at the desired locations. The controlling factor in setting up a communications link is the speed with which an earth station can be transported and erected. The erection time being of the order of several hours for a station crated in, or a considerably shorter time for a road transportable earth station on a truck or a trailer. Depending on the communications equipment contained in the earth station any combination of the following services can be supported - voice, data, fax and video.

With the advent of the National Satellite System, the ABC regional transmitters will use the Homestead and Community Broadcasting Satellite Service (HACBSS) as a programme source, being supplemented from the transmitter's own studios if applicable. With the co-operation of the ABC, HACBSS will be a useful tool for the dissemination of disaster warnings and information to the general public.

Modes of Operation

When using the satellite for communication, two modes of operation can be supported. Firstly, the point to point mode, illustrated by the telephone service where only two parties communicate. Secondly, the broadcast mode where other parties with suitable earth stations may listen to or participate in the communications.

When designing the communications network, these two modes of operation should be considered remembering that the parties may be located anywhere in Australia and that the services that can be supported are only dependent on the earth station equipment provided.

SATELLITE NETWORKS TO BE CONSIDERED IN DISASTER HANDLING

1. Department of Aviation - Air Traffic Control

2. Telecom - Remote Telephony Satellite Service
3. HACBSS 1 - ABC Regional Program Distribution

1. Department of Aviation - Air Traffic Control

In some disaster situations, the full scope of the disaster can only be seen from the air, so communications with aircraft is necessary. The network for air traffic control consists of satellite links between ground facilities located all over Australia and VHF links from the ground facilities to the aircraft. The system is duplicated on two satellites. A transportable DOA earth station could replace point to point links destroyed by a disaster.

2. Telecom - Remote Telephony Satellite Service

Telecom have purchased an initial quantity of 60 homestead and five transportable earth stations for use in the provision of their services. The satellite system will feed into the terrestrial system through an earth station at Bendigo in Victoria. The five transportable units are designated for emergency use.

3. HACBSS 1 - ABC Regional Program Distribution

As mentioned earlier, ABC will use high powered satellite transponders in each of the four zones to feed most of its regional transmitters and to broadcast directly to small dishes in remote areas. As well, the ABC will have satellite capacity for the interchange between studios, Australia wide, of video and sound programs. This service will be able to disseminate emergency warnings and information.

EARTH STATIONS

In a disaster situation, transportable earth stations will normally be required to be moved to the disaster site. The disaster HQ site, normally in a capital city such as Canberra, would be linked to the remote earth station by the local Major City Earth Station.

The antenna size at the central site will have a direct bearing on the required antenna size at the disaster site. The bigger the antenna at the central site, the smaller the antenna (within certain constraints) at the disaster site may be. A small antenna has many inherent

advantages which will be pointed out in the discussion on transportable earth stations. One means of access to a large antenna is to lease capacity in AUSSAT's Major City Earth Station, and linking via land lines to the disaster HQ.

The means of connecting between the central site earth station and the appropriate personnel and locations must be carefully considered. The consideration should include the type of communications to be carried and the reliability of the link.

Transportable Earth Stations

In the disaster situation a transportable earth station needs to be complete and ready for use when shipped, and must include antenna, mount, power generating plant and peripherals such as telephone, telex or fax equipment if they are not supplied from other parts of a disaster package.

When considering a transportable earth station, the point of most concern is the directional stability of the antenna in windy conditions. The pointing stability is dependent on two factors (a) the design of the antenna mount, and (b) the size of the antenna. The larger the antenna the higher the wind loads and the more difficult is to keep the dish pointing precisely at the satellite.

The team of people who operate a transportable earth station should obviously be experienced in erecting the system and pointing the antenna to acquire the satellite signal.

Types of Transportable Earth Station

It is envisaged that two distinct types of transportable earth station could be used in disaster situations. The first type of a relatively permanent nature ("fixed") would be moved in after the disaster has occurred. The earth station would be stored for considerable period of time with no requirement to relocate it at short notice. This station would be packaged in a number of crates, suitable for transportation by air or road. On arrival at the site it would take a number of hours for the station to be assembled before being ready for use.

The second type of station for immediate use ("road transportable") would be a fully assembled, self contained and ready to operate station mounted on a trailer. This station would be operational within a short time of arriving at the site, the only requirements being to stabilise the trailer and point the antenna in the direction necessary to acquire the satellite.

SPECIFICATIONS OF A TYPICAL CUSTOMER EARTH STATION

Carrier Type	Single Channel per Carrier		
Channel Capacity	3 kHz Voice or 9600bps data		
No. of Carriers (depends on selected HPA)	1 to max. of 8		
Dish Diameter	2.4 metres		
Power Consumption	1 ch.	4 ch.	8 ch.
Receiving	50	250	300 watts
Transmitting	110	550	750 watts

Weights (Packed)

Dish	65 kg
Mount (design dependent)	80-200 kg*
Feed	20 kg
Equipment (peripherals and generator additional)	70 kg

* No package over 70 kg

CRATE SIZES (in metres)

Antenna	2.5 x 2.5 x 1
Mount	Pieces under 3 metres in length or Box 1.5 x 1.4 x 1
Feed	1.5 x 0.5 x 0.5
Equipment	1.2 x 1.2 x .8

DISASTER SCENARIOS

Each disaster scenario will be looked at individually considering the following points:

- (a) Any facilities AUSSAT has in the disaster area.
- (b) Satellite facilities needed at the disaster area.
- (c) Places with which contact needs to be made.
- (d) Equipment required at sites other than disaster site.

Cyclone at Cairns

AUSSAT has no current plans to have facilities at Cairns. To take advantage of the satellite capabilities, it would be necessary to ship in a customer earth station with the required capabilities and peripherals, or use other earth stations owned by other organisations in the area.

Two way contact would need to be made with at least the State Emergency Services in Brisbane and if possible with N.E.O.C. in Canberra. In both these locations AUSSAT has a Major City Earth Station which could be used, provided the communication channels between the station and the desired locations within the cities can be established.

The time taken to establish this communications link could be only a few hours from the arrival of the customer earth station at Cairns. The available facilities would be voice or data (which would include telex and fax) but other services such as video conferencing could be provided if the necessary terminal equipment is available.

Bushfires in Victoria

In the case of bushfires, the station at the disaster site would have to be able to be moved to another site at very short notice, this implies the need of a "road transportable earth station". There would have to be a number of these stations throughout the disaster area which would need to communicate with each other and Melbourne. It is anticipated that only voice and data channels would be required.

Consideration needs to be focussed on the communications paths from Headquarters, regional operation centres, ground teams and aircraft to their appropriate destinations. The problem of a number of isolated systems working together, is critical in emergency situations for efficient communication.

The general public needs to be continually up dated of the status of the disaster. In this case, the ABC using HACBSS to feed their regional transmitters would give a highly reliable distribution network for this information.

Earthquake at Adelaide

The proposed site for the Adelaide Major City Earth Station is over 5 kms from the Para fault. It is anticipated that no structural or equipment damage which could not be quickly repaired would occur. The earth station has its own diesel generator and would be available for immediate use. The communication links with the ABC Adelaide Studios would certainly be broken. The emergency co-ordination centre would be at Birkenhead near Port Adelaide. Any communications links between the Earth Station and Birkenhead would have a good chance of survival.

The communications would need to be with N.E.O.C. in Canberra and the other state capitals, which would be possible if the links from AUSSAT's earth station to the required locations in each city could be arranged.

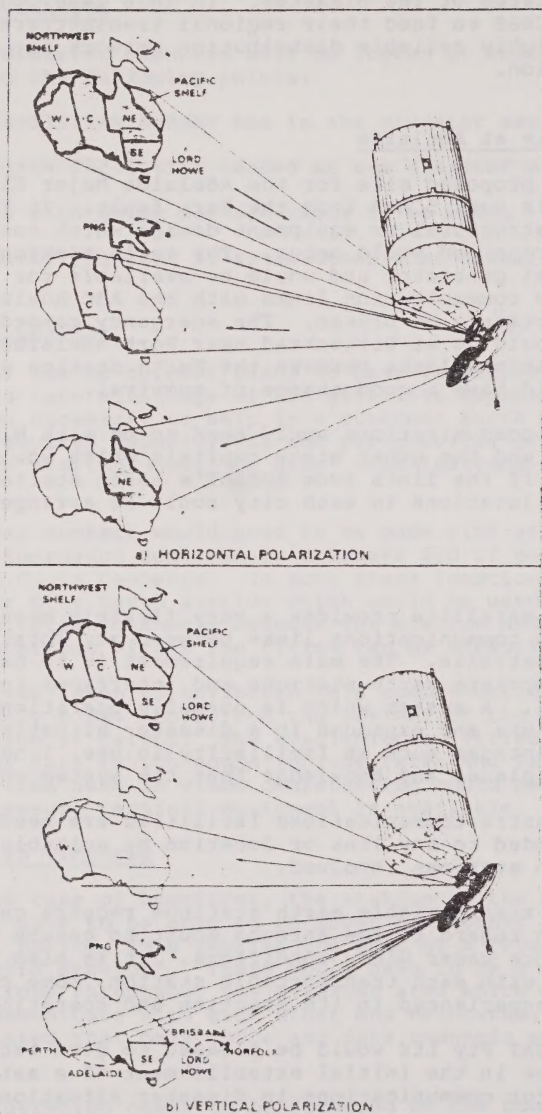
SUMMARY

The satellite provides a very flexible means of providing communications links between any locations within Australia. The main requirement is to have available the appropriate earth stations and interfaces to the personnel. A system which is normally operational for everyday use and expanded in a disaster situation has many advantages such as familiarity in use, lines to the required places and knowledge that the system works.

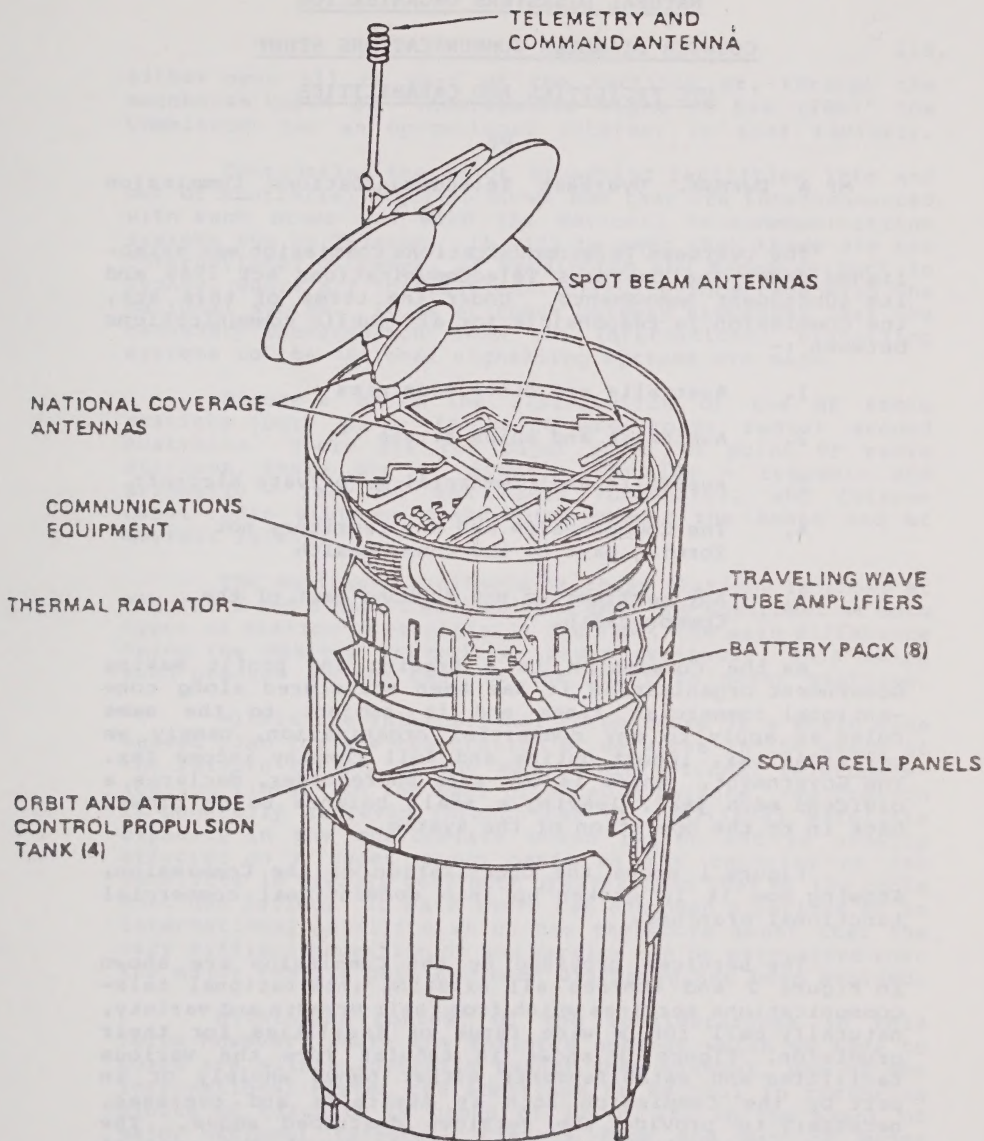
If extra communications facilities are needed, they can be added to any link or location by suitably equipping the earth stations involved.

The transportable earth stations require careful design in regard to the antenna mount to ensure good performance under windy conditions. It is also desirable to have, with each transportable station, some personnel who are experienced in its erection and operation.

AUSSAT Pty Ltd would be pleased to give technical assistance in the initial establishment of a satellite network for communications in disaster situations.



AUSSAT COVERAGE



AUSSAT SPACECRAFT CONFIGURATION

NATURAL DISASTERS ORGANISATION
COUNTER DISASTER COMMUNICATIONS STUDY
OTC FACILITIES AND CAPABILITIES

by

Mr A Durham, Overseas Telecommunications Commission

The Overseas Telecommunications Commission was established under the Overseas Telecommunications Act 1946 and its subsequent amendments. Under the terms of this act, the Commission is responsible for all public communications between :-

1. Australia and other countries
2. Australia and ships at sea
3. Australia and commercial or private aircraft
4. The Commonwealth and any territory not forming part of the Commonwealth
5. Any territories not forming part of the Commonwealth.

As the Commission is a trading and profit making Government organisation it has been structured along conventional commercial lines and is subject to the same rules as apply to any commercial organisation, namely we pay sales tax, import duties and full company income tax. The Government, which is our sole shareholder, declares a dividend each year, leaving a small balance to be plowed back in to the operation of the system.

Figure 1 shows the organisation of the Commission, showing how it is broken up into conventional commercial functional branches.

The services provided by the Commission are shown in Figure 2 and embrace all existing international telecommunications services which from their breadth and variety, naturally call for a wide range of facilities for their provision. Figure 3 shows in tabular form the various facilities and establishments either owned wholly or in part by the Commission both in Australia and overseas, necessary to provide the services described above. The majority of the facilities are wholly owned, but some of them are owned in part through the Commission's membership of the international consortium concerned (such as INTELSAT, SEACOM partners etc).

Figure 4 shows the major international telecommunications links used by the Commission in meeting its obligations. In each of the links shown the Commission

either owns all or part of the facility or, through the mechanism known as "Indefeasible Right of Use (IRU)" the Commission has an operational interest in that facility.

Considering the major broadband facilities into and out of Australia, Figure 5 shows how they are interconnected with each other and with the national telecommunications systems run by Telecom. It will be seen that there are two international gateways, at Paddington and Broadway both in Sydney, where all international circuits interface with the national system. It is at these gateway exchanges that the necessary conversation from the international signalling systems to the national signalling systems are made.

Figure 6 shows the distribution of the HF radio stations (both point to point and coast radio) around Australia. There are two major point to point HF radio stations, these are at Sydney (Doonside - transmit and Bringelly - receive) and Perth (Gnangara), and fifteen coast radio stations distributed around the coast and at Norfolk Island.

The equipment available at these stations is shown at Figures 7 and 8 and it will be seen that the equipment at both types of station is essentially the same, the main difference being the maximum transmitter power available, this being much greater in the case of the point to point stations.

Within the international forum there is a world wide agreed plan for the restoration of services in the event of the failure of any of the major international telecommunication links. In the case of a cable failure, restoration is generally achieved through use of additional satellite capacity in the appropriate ocean region and is usually effected on a super group basis as the capacity of the satellite is usually very much greater than that of the cable that has failed. To date there has not been a failure of an international satellite, which has therefore meant that the very difficult question of how service can be maintained when the major traffic path has been disrupted, has been avoided.

Within the context of the considerations in this forum however, where the failures against which we have to guard are within Australia rather than without, use of the international system can sometimes be helpful in restoring blocks of circuits (a group of 12 or 16) in the event of major national failure. Clearly from the map of major facilities shown on Figure 4, only certain scenarios can be covered, for example circuits can be provided between the east coast and the west coast (Moree to Carnarvon) via the INTELSAT satellite in the event of major disruption to the east-west microwave link operated by Telecom. Another example is the provision of circuits between Sydney and

Brisbane should a disaster totally disconnect the two cities, the routing then being Sydney to New Zealand via either Compac or Tasman cable (or the future ANZCAN cable) thence via satellite to Guam and then via Seacom cable from Guam to Cairns and then down to Brisbane.

These sorts of emergency communications are however, only suitable for the special specific case of major total disruption within Australia. A more likely situation is one such as is predicated for our study here to a greater or lesser degree.

The network of coast radio stations around Australia shown in Figure 6 and the fact that they are all equipped with HF and/or VHF radiotelephony, radiotelegraphy and in the case of Sydney and Perth radiotelex facilities, means that each station can talk to each of the others and can therefore be used as a gathering, relaying or interconnection point to the national network, as all stations have access to the Telecom network. For example should the microwave link feeding Esperance be cut, then, through the HF facilities at Esperance messages and telephone calls can be carried through to Perth where they could be directly interconnected into the Telecom national network to restore basic service facilities.

In the particular case of the scenario presented to us, I would now set out the impact of the disasters upon the relevant OTC facilities and what capabilities would be left in order to provide some form of continued service.

CAIRNS

The Cairns cable station is some 1/4 of a mile from the shore at Astrolabe Bay, some 1 1/2 to 2 miles north of the town centre, but is less than ten feet above sea level. In the event of a five metre cyclonic surge tidal wave, there is little doubt from the flood maps currently available, that the station would be inundated to a depth of over 2 metres. The site has no protective bund wall nor is the building specifically arranged for protection against flood waters. The building is of double brick construction, but with normal doors giving access to the outside.

Standby power is available from the station diesel alternator set which has an underground tank holding sufficient capacity to run the station on normal load for six days.

However 2 metres of salt water over both diesel and cable transmission and terminal equipment can be guaranteed to make all systems cease operation immediately and, regretfully, for some considerable time.

As far as continuity of international communications is concerned, the two submarine cable systems passing through Cairns, namely Seacom and APNG would both be restored by means of previously agreed restoration plans, within approximately two/three hours. However once the flood waters have receded then the length of time before normal operation could be restored is likely to be fairly lengthy. In the case of the APNG cable, there is a quantity of catastrophic emergency spare equipment held in Sydney for the TASMAN cable system which is identical, which could be made available and which if flown to Cairns, could perhaps be installed to restore operation of the APNG system within two to four weeks. However in respect of the SEACOM equipment which uses an older valved type of equipment, including rotating power machinery, an outage of at least one month if not considerably more, must be expected.

In short the catastrophe at Cairns would not disrupt the international communications normally routed via the cable station for more than approximately two/three hours but there would be a considerable length of time before the station could be restored to its normal functioning. During that time there would be no possibility of the station being able to provide, on an ad hoc basis, any communication facilities to the local emergency services.

ADELAIDE COAST RADIO STATION

Adelaide radio is situated approximately 3 km southwest of McLarenvale Post Office which itself is approximately 25 km south of Adelaide and the station is thus some 8 km outside the main specified damage area.

Like all our other stations, it is equipped with standby power generation with above ground storage tanks giving it capacity for six days continuous operation under normal load. It is expected that the building and equipment therein would be unaffected by the earthquake and that the masts themselves would also, being heavily guyed, be unaffected. However some damage is expected to occur to the aerials strung between the masts owing to expected "whipping" of the masts causing excessive tension on the aerial conductors themselves. Those aerials that are so broken could be restrung, at least in a temporary manner, within 12 to 24 hours provided there are no extensive after shocks and services generally would not be markedly interrupted.

Adelaide radio is connected by means of a 30 pair cable to McLarenvale Post Office where, in the event of the total destruction of facilities within Adelaide, access could be provided to the basic service facilities out of Adelaide radio, namely HF radio telephony and telegraphy

to any of the other coast radio stations throughout Australia.

MELBOURNE RADIO COAST RADIO STATION

Melbourne radio is situated at Cape Schanck on the Mornington Peninsula in an area which is largely agricultural grazing. The station can therefore be safely regarded as being sensibly outside the likely bushfire risk areas and therefore would be unlikely to be affected by this particular catastrophe. However in the event of failure of major public services such as electric power, the station is equipped with its own standby generator with sufficient fuel on the station to run it for 4 days under normal load conditions.

Again as in the case of Adelaide, Melbourne radio is connected by means of an underground cable to Dromana Post Office, thence by broadband facilities to the Melbourne City West exchange. In the event of interruption to the broadband system then access to the facilities available out of Melbourne radio could be provided at the Dromana exchange.

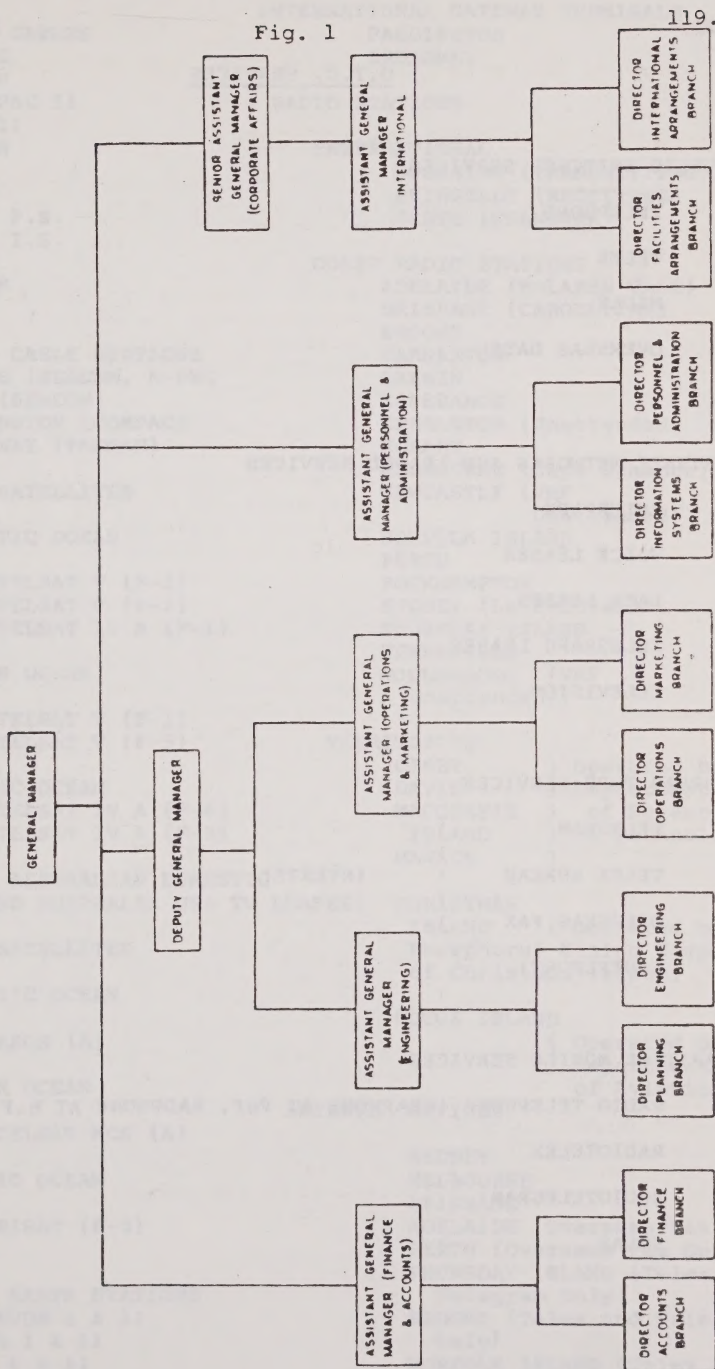
NETWORK MANAGEMENT

During the February 1983 bushfire disasters in South Australia and Victoria, considerable congestion occurred within both the national and international systems as a result of a well meaning act on the part of the media who extensively publicised telephone numbers (2 in Adelaide and 2 in Melbourne) to be used as a direct information service. As a result of this, both national and international traffic increased enormously, and in the case of international traffic, conversation minutes to Adelaide for example increased by an unprecedented sixfold when compared to a normal day.

As a result of this sudden increase in traffic there was considerable congestion, for example on 17th February call congestion to Adelaide averaged 25% reaching up to 77% during the worst hour.

The lesson we learnt from the experience in Adelaide and Melbourne is that whilst the concept of publicised information numbers is very good, they should be situated well outside the disaster area so that congestion caused through the rush of concerned subscribers calling for information can be moved away from the disaster area, where it is most important that no congestion in communication facilities should occur.

OVERSEAS TELECOMMUNICATIONS COMMISSION (AUSTRALIA) ORGANISATION



O.T.C. SERVICES

PUBLIC SWITCHED SERVICES

TELEPHONE

TELEX

MIDAS

OVERSEAS DATEL

PRIVATE NETWORKS AND LEASED SERVICES

INTERPLEX

VOICE LEASES

DATA LEASES

TELEGRAPH LEASES

TELEVISION

BUREAU TYPE SERVICES

TELEGRAM)

TELEX BUREAU)

OVERSEAS FAX)

(INTELPOST)

INTERTEL

MARITIME MOBILE SERVICES

RADIO TELEPHONE (SEAPHONE AT VHF, RADPHONE AT H.F.)

RADIOTELEX

RADIOTELEGRAM

SOLAS

SUBMARINE CABLES

COMPAC
SEACOM
TRANSPAC II
HAW III
TASMAN
APNG
OLUHO
ASEAN P.S.
ASEAN I.S.
IOCOM
ANZGAM

SUBMARINE CABLE STATIONS

CAIRNS (SEACOM, A-PNG)
GUAM (SEACOM)
PADDINGTON (COMPAC)
BROADWAY (TASMAN)

INTELSAT SATELLITES

ATLANTIC OCEAN

INTELSAT V (F-3)
INTELSAT V (F-2)
INTELSAT IV A (F-1)

INDIAN OCEAN

INTELSAT V (F-1)
INTELSAT V (F-5)

PACIFIC OCEAN

INTELSAT IV A (F-6)
INTELSAT IV A (F-3)

(CARRIERS AUSTRALIAN DOMESTIC

LEASES AND AUSTRALIA USA TV LEASES)

INMARSAT SATELLITES

ATLANTIC OCEAN

MARECS (A)

INDIAN OCEAN

INTELSAT MCS (A)

PACIFIC OCEAN

MARISAT (F-3)

SATELLITE EARTH STATIONS

CARNARVON 1 & 11
CEDUNA 1 & 11
MOREE 1 & 11

INTERNATIONAL GATEWAY TERMINALS

PADDINGTON
BROADWAY

RADIO STATIONS

INTERNATIONAL

DOONSIDE (TRANSMITTING)
BRINGELLY (RECEIVING)
PERTH (GNANGARA)

COAST RADIO STATIONS

ADELAIDE (McLAREN VALE)
BRISBANE (CABOOLTURE)
BROOME
CARNARVON
DARWIN
ESPERANCE
GERALDTON (Unattended)
HOBART
MELBOURNE (Cape Schanck)
NEWCASTLE (VHF
Unattended)
NORFOLK ISLAND
PERTH
ROCKHAMPTON
SYDNEY (La Perouse)
THURSDAY ISLAND
TOWNSVILLE
WOLLONGONG (VHF
Unattended)

TERRITORIES

CASEY) Operated by
DAVIS) Department
MACQUARIE) of Science
ISLAND) & Technology
MAWSON)

CHRISTMAS

ISLAND (Operated by
Phosphorus Mining Company
of Christmas Island)

COCOS ISLAND

(Operated by
Department
of Aviation)

INTERTEL OFFICES

SYDNEY
MELBOURNE
BRISBANE
ADELAIDE (Overseas Fax only)
PERTH (Overseas Fax only)
THURSDAY ISLAND (Telex and
Telegram Only)
BROOME (Telex and Telegram
Only)
NORFOLK ISLAND (Telex and
Telegram Only)
CHRISTMAS ISLAND (Telex and
Telegram Only)

AUSTRALIA'S MAJOR INTERNATIONAL TELECOMMUNICATIONS LINKS

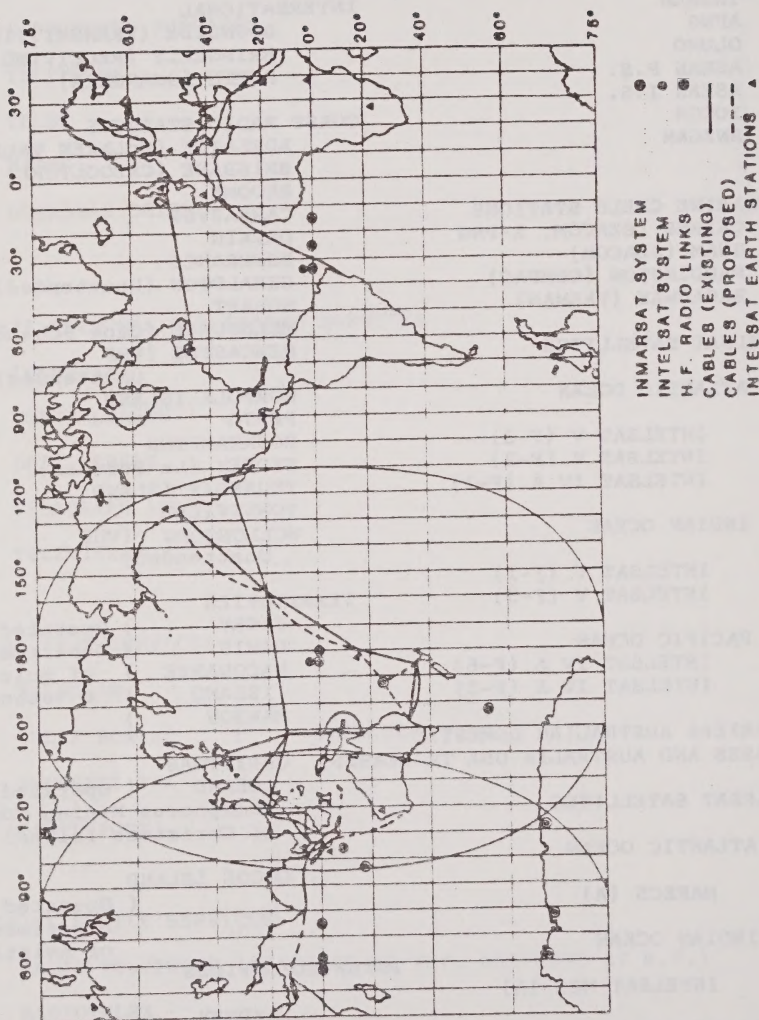
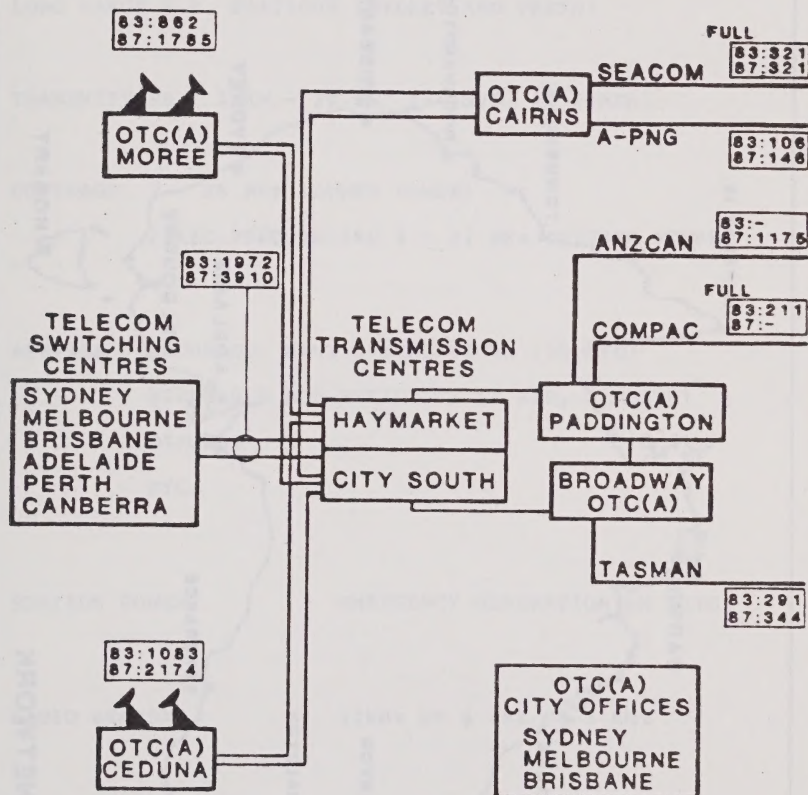


Figure 4.

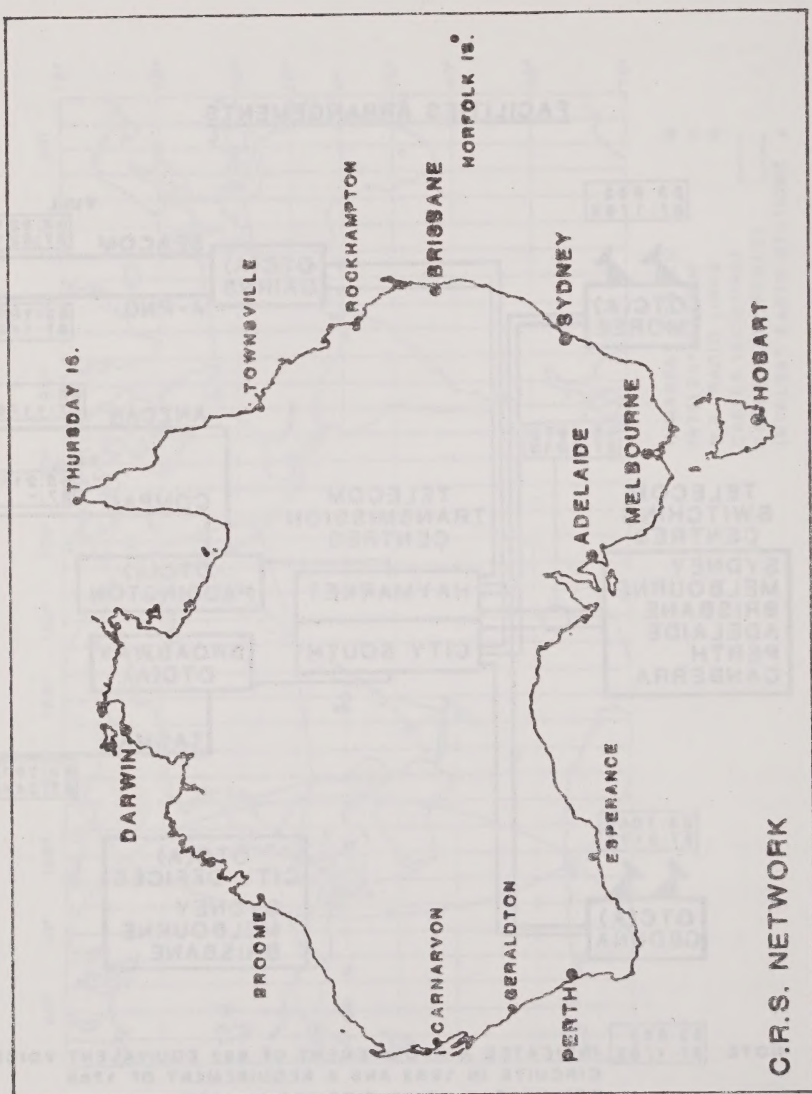
FACILITIES ARRANGEMENTS



NOTE: 83:862 87:1785 INDICATES A REQUIREMENT OF 862 EQUIVALENT VOICE CIRCUITS IN 1983 AND A REQUIREMENT OF 1785 EQUIVALENT VOICE CIRCUITS IN 1987.

Figure 5.

Fig. 6



O.T.C./RADIO SYSTEMS

LONG RANGE H.F. STATIONS (SYDNEY AND PERTH)

TRANSMITTERS 1 KW - 30 KW (34 SYD, 10 PERTH)

COVERAGE 2 - 28 MHz (LOWER POWER)

FIXED FREQUENCIES 4 - 22 MHz (HIGHER POWER)

AERIALS RHOMBICS, MANY ORIENTATIONS (35 SYD)

STEERABLE LOG-PERIODICS (2 SYD, 2 PERTH)

DIPOLAS

ETC.

STATION POWER

EMERGENCY GENERATION ON SITE

RADIO BEARERS

12KHz OR 6 KHz OR 3 KHz

O.T.C./RADIO SYSTEMSC.R.S. STATION TYPICAL ARRANGEMENT

TRANSMITTERS	500W - 2 KW
COVERAGE	2-28 MHz (Synthesiser 400-500 KHz Controlled)
AERIALS	MARINE BANDS + EMERGENCY BROADBAND + STOWABLE EMERGENCY REPLACEMENT IN CYCLONE AREAS.
STATION POWER	EMERGENCY GENERATION AT EACH SITE

AUSTRALIAN COUNTER DISASTER COLLEGECOMMUNICATIONS STUDYAUSTRALIAN INTERNATIONAL TELEPHONE SERVICEAUSTRALIAN BUSHFIRES: 16TH - 19TH FEBRUARY, 1983OTC(A) NETWORK MANAGEMENT SECTION OPERATIONS BRANCH

The bushfire disasters in South Australia and Victoria, which occurred over the period 16-19th February 1983, were marked by very high and sustained levels of international telephone traffic to Adelaide and Melbourne.

At the height of the blaze on 17th February 1983, conversation minutes to Adelaide increased by an unprecedented 6-fold, when compared to a normal day. Traffic to Melbourne was up by more than 3-fold. The total Australian terminating traffic on this day, at 645,000 conversation minutes, was only surpassed by the Christmas Day 1982 traffic volume of 858,000 conversation minutes.

The bulk of the overseas traffic originated from the UK, West Germany, Netherlands, New Zealand and Canada. The 4-day total Australian terminating traffic was up a significant +70% as compared to a typical 4-day period.

1. Service Performance

The overall service as seen by the subscribers, particularly to South-East Australia, was significantly degraded to that experienced normally. The degradation was primarily due to the inability of the existing network capacity to cope with such a marked upsurge in traffic levels.

On the peak day, 17th February 1983:-

- (i) call congestion to Adelaide averaged 25%, and reached up to 77% during the worst hour. For traffic to Melbourne, the average was 20%, and reaching up to 74%;
- (ii) call attempts to Adelaide averaged 5.5 attempts per successful call, and required a high 18 attempts during the worst hour. The corresponding figures to Melbourne were 3 and 6 attempts. These compare with approximately 2-3 attempts during a typical day;
- (iii) Answer Seizure Ratio (ASR%) to Adelaide averaged 16.3%, with an average of 41.3% to Melbourne.

With a relatively lower surge of outgoing traffic from Australia, the overall service to overseas destinations

was satisfactory. However, the performance was degraded during the time coincident busy hour peaks, due to the severe pressure of the incoming traffic levels.

For example, traffic to the UK on 17th February 1983, (which recorded by far the biggest increase, up +130%), the call congestion averaged a relatively low 5%, and reached 22% during the bothway traffic peak. An average of 2 attempts were required for each successful call, with up to 3 attempts in the busy hour. For traffic to West Germany and Netherlands, (which showed the next highest increases for the day, up +50%), the call congestion reached 10%.

However, despite the overall congestion, a significant +37% increase in total bothway paid traffic over a typical 4-day period was achieved.

Details concerning the performance on national routes which experienced high traffic levels, are attached.

2. Network Management

One of the main reasons for the very high traffic into Australia, was that the bushfire tragedy and destruction, featured prominently in overseas news bulletins. In addition, the UK TV stations broadcast Australian Red Cross telephone numbers (two in Adelaide and two in Melbourne), as a means of a direct information service.

To cope with these peak traffic conditions and to provide the best possible service to the subscriber, and also to protect the network from severe overload, the following real time Network Management tactics were employed:-

- (i) the national circuit capacity to Adelaide and Melbourne was expanded with alternate routes via Sydney and Perth. Calls unable to find a free circuit into the national network, were diverted to a recorded voice announcement. For example, on 17th February 1983, 25% out of a total 121,000 call attempts to Adelaide, were switched to the recorded announcement;
- (ii) the large volume of call attempts to the Red Cross numbers, (representing over 30% of all calls to Adelaide when the numbers were first publicised), were automatically filtered out. The traffic was controlled by allowing up to 5% of these calls to pass through, and the remainder diverted to a recorded announcement. With only five lines to the two Red

Cross numbers, this action eased the probability of OTC(A) processor exchange overload, and lowered the congestion of the national network with ineffective traffic;

- (iii) the UK IMC was requested to remove the flood Red Cross traffic at the UK exchanges. By eliminating this ineffective traffic nearer to the source, the congestion on the Australia-UK international route would be reduced. However, as the UK lacked the facility for selective code analysis, this function was performed by Canada and US, which were carrying high levels of UK overflow traffic to Australia;
- (iv) overseas INMC's and in particular the UK, were asked to limit the number of operator call attempts. In addition, Canada and the US were requested to restrict the large volume of overflow traffic through their centres to Australia area codes 8 (Adelaide) and 3 (Melbourne). This ensured that the available circuits were utilised with paid traffic, and that normal traffic to other overseas destinations was not adversely affected;
- (v) as a further means of easing the traffic pressure into Australia, (and as the service into Australia was relatively poor), a total of 54 bothway UK circuits were directionalised in favour of Australia outgoing traffic. This action resulted in an improved performance for the high traffic levels to the UK - reducing call congestion from around 20% down to 2%;
- (vi) overflow traffic to the UK was switched via Hong Kong, Japan, Singapore and US. By means of an All Circuits Busy (ACB) signal received from Hong Kong, this enabled the overflow traffic level to be dynamically controlled through Hong Kong to the UK. As ACB signals were not available from the other transit centres, the level of overflow on these routes was controlled as required (based on traffic flow performance analysis), by means of typewriter commands to OTC(A) exchanges.

3. Conclusion

The use of effective Network Management strategies enabled a significant +70% increase in Australian terminating traffic to be carried during the 4-day bushfire period - without the provision of additional network capacity.

Considering the high focussed traffic levels to South-Eastern Australia, and the limited national and international network capacity, the overall performance was satisfactory. However, calls to Adelaide and Melbourne required many repeated attempts, with long delays being experienced during some busy hours.

As illustrated by this bushfire tragedy, major national disasters can be characterised by marked and sudden traffic surges to the affected areas. This focussed overload condition, with a rapid multi-fold increase in the call attempt rate, can result in severe congestion and exchange processor overload. This "snow-balling" effect could then seriously degrade the overall international telephone service - as was also experienced during the Italian earthquake in November 1980.

Accordingly, it is believed that a set of Network Management procedures or guidelines should be formulated, as part of a general recommendation to be followed by all national and international administrations, to protect the communications network in the event of any future major national disaster.

The Network Management actions as implemented by OTC(A) with the assistance and cooperation of overseas INMC's, resulted in an improved grade of service to the subscribers - and these aspects could be included in any initial study.

Other points which may be considered are:

- stipulate to national emergency bodies or disaster relief organisations not to issue or publicise overseas any direct telephone numbers. Possibly, these agencies could channel updated information concerning any disaster to their counterparts overseas, and the overseas subscribers could then be encouraged to contact their local agencies;
- international operators could be instructed to work "back-to-back" or open-line situation, thereby ensuring an orderly and efficient processing of calls.

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DESTINATION - ADELAIDE

TABLE 1

TPHONE TRAFFIC VIA ROUTES	Conversation Time					Answer Seizure Ratio				
	Typ	16th	17th	18th	Dec 25	Typ	16th	17th	18th	Dec 25
SYDC2	-	10,651	9,452	9,456	15,358	-	14.7	13.3	40.2	50.9
SYD2	294	14,558	32,769	33,690	10,909	30.5	20.6	20.5	47.1	46.1
AEB1	11,157	18,539	21,935	21,936	22,695	55.8	49.0	50.1	56.3	61.7
AEA2	1,338	5,648	3,554	5,552	17,438	52.3	35.1	44.1	61.3	60.9
PHA1	-	1,301	6,174	5,434	79	-	19.6	28.5	58.9	46.7
PHCS	-	-	-	-	42	-	-	-	-	50.0
AEA1	-	-	834	964	-	-	-	51.4	56.8	-
PHH2	-	910	19	1,728	-	-	18.0	5.7	56.3	-
TOTAL	12,645	51,607	74,737	78,759	61,520	54.00	21.5	16.3	34.4	38.3

TABLE - 2

DESTINATION - SOUTH AUSTRALIA (EXCLUDING ADELAIDE)

	Typical Day	Feb 16	Feb 17	Feb 18	Feb 19	Dec 25
D A I L Y	Conversation Time	2,261	5,955	10,640	13,229	10,887
	% ISD Penetration	71.6	-	-	-	-
	% Daily to All DEST	0.7	1.34	1.6	2.1	2.4
	Answer Seizure Ratio	36.3	20.6	17.0	30.6	83.2
	Call Congestion	-	11.6	9.1	.7	0.1
	Attempts per Call	2.8	5.9	4.2	4.8	3.5
B U S I E S S E S	Conversation Time	252.5	-	-	-	-
	Answer Seizure Ratio	47.4	-	-	-	-
	Carried Traffic (erl)	4.8	-	-	-	-
	Call Congestion	-	-	-	-	-
	Attempts per Call	2.2	-	-	-	-
H R	MAX. ATTEMPTS per Call	3.5	-	-	-	-
% of Total Attempts Switched to RVA		-	4.1	16.4	9.0	2.4

DESTINATION - SOUTH AUSTRALIA (EXCLUDING ADELAIDE) (continued)

TPHONE TRAFFIC VIA ROUTES	Conversation Time				Answer Seizure Ratio					
	Typ	16th	17th	18th	Dec 25	Typ	16th	17th	18th	Dec 25
SYC2	-	1,087	1,390	1,675	2,425	-	12.8	13.0	29.5	36.7
SYD2	49	1,822	4,555	5,978	2,339	21.11	18.8	16.9	32.2	35.0
AEB1	1,993	1,960	3,126	3,361	4,004	33.5	39.1	42.8	37.2	40.6
AEB2	225	892	-	-	1,870	44.1	29.1	-	-	46.4
PHAL	-	111	805	987	-	-	18.5	21.4	33.2	-
PHH2	-	83	6	224	-	-	13.0	20.0	37.0	-
AEAL	-	-	148	108	-	-	-	47.6	37.0	-
AEA2	-	-	611	897	-	-	-	40.3	40.1	-
TOTAL	2,261	5,955	10,640	13,229	10,637	36.3	20.6	17.0	30.6	27.4

TABLE 3

DESTINATION - MELBOURNE

	Typical Day	Feb 16	Feb 17	Feb 18	Feb 19	Dec 25
D	Conversation Time	73,514	123,367	239,731	221,492	154,083
A	% ISD Penetration	65.2	74.9	74.8	73.5	73.0
I	% Daily to All DEST	23.1	27.9	37	36	33.9
L	Answer Seizure Ratio	55.2	46.9	41.3	47.6	48.0
Y	Call Congestion	-	4.9	20.2	1.8	0.5
	Attempts per Call	1.8	2.2	3.0	2.03	2.1
B	Conversation Time	6,438	11,623	13,972	14,475	11,281
U	Answer Seizure Ratio	55.9	51.7	55.9	61.9	56.0
S	Carried Traffic (erl)	117.5	226.8	272.91	270.75	214.7
I	Call Congestion	-	15.9	28.2	2.0	0.2
E	Attempts per Call	1.8	2.3	2.49	1.65	1.79
S						
T						
H						
R						
	MAX. ATTEMPTS per Call	2.3	3.76	6.2	2.58	2.3
	% of Total Attempts Switched to RVA	-	-	1.5	5.0	1.6
						-

TABLE - 3

DESTINATION - MELBOURNE (continued)

TPHONE TRAFFIC VIA ROUTES	Conversation Time				Answer Seizure Ratio					
	Typ	16th	17th	18th	Dec 25	Typ	16th	17th	18th	Dec 25
MEC1	3,378	8,369	15,628	16,529	7,308	65.4	53.1	50.6	51.9	56.2
MEB1	40,427	54,438	91,913	89,076	89,134	60.5	44.5	37.2	47.4	48.7
MEEL	12,385	15,033	19,910	19,375	18,491	56.8	54.0	48.9	53.1	53.4
MEE2	16,666	21,210	28,263	28,358	24,226	59.3	53.1	48.9	52.4	53.7
SYC2	12	13,031	48,247	37,508	16,746	100.0	41.4	43.5	52.2	50.7
SYD2	584	11,284	33,602	29,903	15,507	50.3	46.3	44.1	52.7	52.3
HEA1	-	-	-	-	3,403	-	-	-	-	48.3
HED1	-	-	-	-	1,000	-	-	-	-	44.7
PHA1	-	-	1,081	368	124	-	-	49.6	38.9	53.8
PHCS	-	-	-	-	26	-	-	-	-	95.0
PHH2	-	-	1,088	375	-	-	-	50.8	39.6	-
TOTAL	73,514	123,367	239,731	221,492	175,966	55.2	46.9	41.3	47.6	44.2

TABLE 4

(EXCLUDING MELBOURNE)

VICTORIA

DESTINATION

	Typical Day	Feb 16	Feb 17	Feb 18	Feb 19	Dec 25
DAILY						
Conversation Time	6,489	15,572	39,025	38,062	26,110	35,091
% ISD Penetration	63.2	75.9	72.9	73.9	74.3	69.1
% Daily to All DEST	2.2	3.5	6.05	6.2	5.75	4.1
Answer Seizure Ratio	38.0	33.0	35.9	41.3	39.3	32.7
Call Congestion	-	9.1	25.5	0.7	0.7	39.3
Attempts per Call	2.7	3.2	3.6	2.4	2.5	5.9
BUSINESS						
Conversation Time	708	1,694	2,482	2,601	1,945	2,200
Answer Seizure Ratio	39.9	38.1	54.8	52.0	50.1	34.0
Carried Traffic (erl)	13.2	34.36	49.2	52.0	38.5	41.3
Call Congestion	-	21.8	35.1	4.6	0	10.6
Attempts per Call	2.5	3.36	2.8	2.02	2.0	3.7
MAX. ATTEMPTS per Call	3.4	6.56	7.75	3.13	4.16	13.0

AUSTRALIAN COUNTER DISASTER COLLEGE

COMMUNICATIONS STUDY

24 - 27 JULY, 1983

REPORT OF PROCEEDINGS

TABLE OF CONTENTS (Continued)

	<u>Page</u>
<u>Annex D (continued) :</u>	
Overseas Telecommunications Commission by Mr A Durham, OTC.	114
TELECOM - Communication Capabil- ities During Emergencies by Mr N Ross, TELECOM.	144
Alternative Capabilities Within Australia for Radio Communications in Disaster Situations by Mr J McPhee, Radio Frequency Management Division, Dept of Communications.	188
<u>Annex E :</u>	
State and Territory Position Papers (Precis Versions)	
Queensland - Information on Cairns Area Communications	215
New South Wales	219
Victoria	225
Australian Capital Territory	230
Tasmania	232
South Australia	237
Western Australia	259
Northern Territory	265
<u>Annex F :</u>	
Discussion Exercises	270

AUSTRALIAN COUNTER DISASTER COLLEGE

COMMUNICATIONS STUDY

24 - 27 JULY, 1983

REPORT OF PROCEEDINGS

TABLE OF CONTENTS

	<u>Page</u>
<u>Introduction</u>	
The Study's Aim and Scope	1
Attendance	2
<u>The Study Program</u>	3
<u>Opening Address</u>	4
<u>Keynote Address</u>	5
<u>Presentations</u>	6
<u>Discussion Exercises</u>	7
<u>Conclusion and Closing Addresses</u>	7
<u>Annex A</u> : List of Attendees	19
<u>Annex B</u> : Program	23
<u>Annex C</u> : Keynote Speakers Address - Communications Management in Disaster Situations	25
<u>Annex D</u> : Presentations	
Communications Experience in Disasters by Mr R Herron, NDO	37
CD Communications Requirements by Mr R Herron, NDO	42
Defence Communications Support by Major K Twining, Dept of Defence	47
Broadcasts and Emergency Broad- casting by Mr D Kelly, Broadcast- ing Division Dept of Communicat- ions	54
AUSSAT Pty Ltd and Satellite Capabilities in CD Communications by Mr D Kennedy, Systems Manager, AUSSAT Pty Ltd.	73

TABLE 5 (continued)

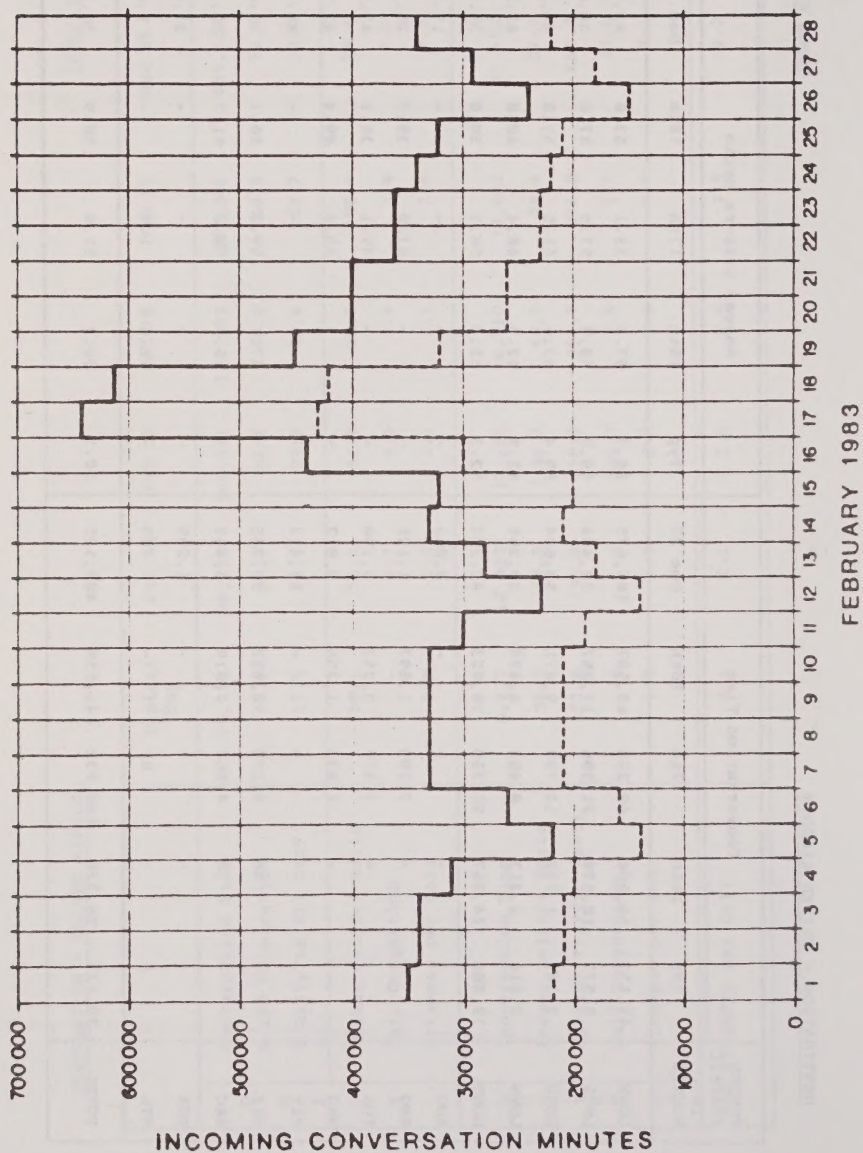
DESTINATION - SYDNEY (continued)

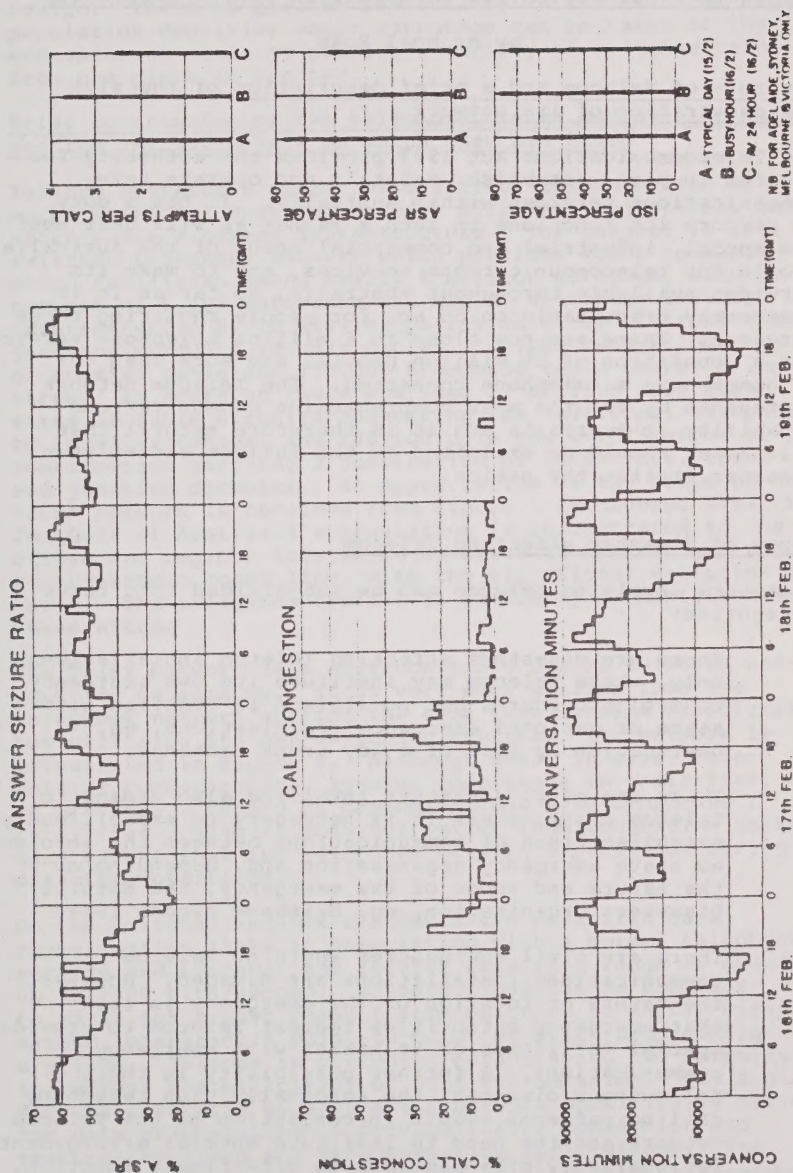
TPHONE TRAFFIC VIA ROUTER	Conversation Time				Answer Seizure Ratio					
	Typ	16th	17th	18th	Dec 24	Typ	16th	17th	18th	Dec 24
SYCL	12,275	15,125	16,311	12,378	50,297	59.8	58.4	58.5	54.5	52.9
SYL3	-	-	52.	-	59	-	-	60	-	3.0
SYA1	59,447	58,904	59,365	56,686	89,910	59.8	58.4	58.0	55.7	52.5
SYB1	41,854	44,988	47,060	44,955	50,357	59.6	58.0	58.5	56.6	53.0
SYD1	12,196	13,405	14,422	13,716	19,559	59.6	57.8	56.9	57.8	52.7
SYC2	322	903	1,269	785	13,734	46.8	40.6	50.0	47.1	47.2
SYD2	757	598	510	50	10,368	57.8	53.4	57.5	70.0	49.4
PHA1	-	-	-	-	49	-	-	-	-	64.3
PHCS	-	-	-	-	81	-	-	-	-	50.0
SYH1	-	12	162	112	-	-	100	98	98.3	-
TOTAL	126,513	134,143	139,410	128,914	234,420	50.9	57.8	58.0	55.9	45.6

DESTINATION - UNITED KINGDOM

TABLE 6

TIPHONE TRAFFIC VIA ROUTES	Conversation Time				Answer Seizure Ratio					
	Typ	16th	17th	18th	Dec 25	Typ	16th	17th	18th	Dec 25
LONM	45,157	56,684	69,226	65,587	105,675	56.7	57.3	55.1	52.6	42.8
LNT2	5,577	10,539	21,296	17,857	79,494	58.9	58.9	57.5	57.0	36.0
LOND	2,301	1,732	12,792	9,871	53,644	59.4	53.6	51.5	53.8	44.1
LONW	2,816	2,313	8,483	6,474	40,261	42.9	42.9	40.4	40.0	42.8
LONT	19,086	24,967	28,358	28,623	42,203	52.3	55.7	54.3	50.6	38.3
AUC	-	-	-	-	7,063	-	-	-	-	15.4
SNG	-	-	2,103	1,897	1,126	-	-	47.0	39.7	28.1
TOK	-	-	3,577	3,253	3,190	-	-	49.1	35.5	47.6
HKG	-	-	1,623	1,256	8,017	-	-	48.4	49.4	42.7
PIT	-	-	-	-	15,412	-	-	-	-	46.2
DVR	-	48	8,173	6,823	35,945	-	57.1	59.2	56.1	37.4
SAC	-	38	4,566	1,019	2,447	-	66.7	50.8	51.7	38.1
VCR	-	-	-	-	5,299	-	-	-	-	27.9
MTL	-	-	61	-	749	-	2.6	1.7	-	9.0
TOTAL	75,512	96,328	160,831	142,659	405,525	50.1	56.3	51.9	50.9	38.6





TELECOM - COMMUNICATION CAPABILITIES DURING EMERGENCIES

by Mr Noel Ross

The role of Telecom and a brief description of the size and penetration of its network

The Telecommunications Act 1975 provides the authority for Telecom to plan, establish, maintain and operate telecommunications services within Australia. It has a duty to perform its functions in such a manner as will best meet the social, industrial and commercial needs of the Australian people for telecommunications services, and to make its services available throughout Australia, so far as it is reasonably practicable to do so, for people requiring those services. There are now close to 6 million telephone services for a population of 15 million people, and more than 80% of homes have a telephone connected. The Telecom network represents by far the most comprehensive communications capability in Australia and it is therefore natural that this asset should be exploited to the fullest extent when disaster strikes the nation.

Types of disaster affecting Telecom

Disasters involving Telecom can be sub-divided into three categories:

1. There are disasters affecting Telecom installations only, where Telecom may institute its own emergency control procedures but no liaison is required with state or national emergency organisations, eg, destruction by fire of a key trunk exchange.
2. There are civil disasters involving also damage to Telecom plant, where it is necessary to expeditiously establish lines of communications between the involved state emergency organisation and, depending on the nature and scope of the emergency, the Natural Disasters Organisation, eg, Brisbane floods 1974.
3. There are civil emergencies where no Telecom communications installations are damaged. However, the nature or location of the emergency is such that emergency authorities request Telecom to provide special facilities or to assist with emergency communications. A further possibility is that, following a disaster, the abnormally high telephone calling patterns result in congestion of the Telecom network and the need to institute special arrangements for emergency organisations to effectively function, eg, Victorian bushfires 1983.

The Telecom network possesses a degree of inbuilt

resilience to disasters affecting it, by virtue of the design. There is greater flexibility in the areas of higher population densities where advantage can be taken of the economies of scale to provide a variety of switched paths from one place to another.

Brief description of the telephone, telex and data networks and the infrastructure on which they are based

Telecom operates a number of different communication networks which are designed to meet different objectives, but which share a common infrastructure. The largest is the switched telephone network which provides voice communication facilities among nearly 6 million services, with a network of 5,400 automatic and manual switching centres interconnected by 10 million pair-kilometres of trunk and junction circuits in pair cables, 48,000 tube-kilometres of coaxial cable and 155,000 broadband radio bearer kilometres. In addition there are some 27 million pair kilometres of cable circuits connecting the individual telephones to local exchanges, and 108,000 pole route-kilometres of construction carrying a combination of subscriber, trunk and junction circuits. An appreciation of the scope of the trunk network is obtained from Figure 1 (Broadband Network). The bulk of Australia's population is concentrated in the cities and regions located on or close to the eastern and south-eastern coast line, with the significant exception of Perth. The telephone traffic is similarly concentrated in these areas.

The Telex Network is a self-contained public switched network for telegraphy. It is very much smaller than the telephone network sharing the same transmission facilities, but utilising its own switching centres. The network is illustrated in Figure 2. Although small in size, teleprinter communication assumes importance in a disaster, as it provides a record of communications with broadcast facilities. Also it does not suffer from congestion to the same extent that the telephone network experiences during disaster conditions.

On the switched network customers can establish data communication links in association with a normal telephone service and transmit and receive data at a range of speeds up to 1200 bits/second. Private lines can be provided to cater for higher speed transmission up to 48,000 bits/second, operated in point-to-point or multi-drop configurations. Telecom is currently establishing two networks to improve the efficiency of data transmission. The digital data network will be an overlay network specifically designed for data transmission to provide faster connection and restoration times for teleprocessing applications. The packet switching network (AUSTPAC) will provide a framework for data communications between different equipment and offers high peak data transfer rates, low transit delays and low error rates.

How Telecom has built diversity into its transmission and switching components to reduce the effects of failures - limitations of these approaches

Thus it has been practicable for Telecom to develop a trunk network over the eastern and south-eastern portion of Australia, which includes a significant amount of diversity. This diversity is important to the survival of the trunk network because it means that the failure of one route or broadband bearer does not prevent the traffic from being re-routed on the alternative path. However, it will be evident from Figure 1 that presently, for capital city Perth there is no route diversity nor alternative broad-band system to the one which crosses the Nullabor. Failure of the bearer, due say to a tower failure, would practically isolate Perth. (There is a low capacity aerial wire and pole route which originally provided the east-west communications capability, still in service as a back-up).

In contrast, from Brisbane to Sydney there is not only route diversity (Brisbane - Newcastle - Sydney; Brisbane - Dubbo - Sydney) but also bearer diversity (coaxial cable and broadband radio).

A further planning objective to that of at least one alternative route between capital cities, is the ability to bypass each city, and thereby minimise disruptions occurring in the city area. The recently completed Ceduna-Dubbo coaxial cable broadband system allows Sydney circuits from Perth and Ceduna to bypass Melbourne and Adelaide and the Dubbo to Brisbane broadband system, also recently completed, allows Brisbane circuits from Adelaide and Melbourne to bypass Sydney.

At the capital cities, the trunk traffic is distributed between microwave radio and coaxial cable facilities (Fig. 1) and care is taken to ensure that a failure of any particular transmission link or at any particular exchange building does not cause total failure. In Sydney there is presently duplication of the radio terminals and this diversity is planned for Melbourne in 1984.

In addition to the transmission path diversity provided by various broadband systems and routes, there is also provided switching diversity to enable calls to be routed via different switching machines. The network is organised around a hierarchy of switching machines and a simple example is illustrated in Figure 3. A telephone subscriber connected to exchange t1 in the Holbrook area and wishing to call a subscriber off a telephone exchange t2 in the Gundagai area may have his call routed by a variety of paths depending on the level of traffic on the various routes at the time. Routes are tested in a routine order, with the most direct route being selected first. In the

event that the terminal exchanges t1 and t2 or Holbrook or Gundagai are inoperative, the call would be unsuccessful. However, if higher order exchanges only are rendered inoperative, the call could be successful depending on the amount of telephone traffic at the time.

In several respects the flow of telephone traffic is analogous to the flow of road traffic. Just as failure of your local street will prevent the residents from driving out, so failure of a local telephone exchange will prevent the transmission of calls. However, there are other streets nearby and their residents are not affected by the problem. The local street being short is fairly easy to repair and so it is with local exchanges, that temporary portable units may be brought in to take over the task from the damaged one. Damage to a freeway will affect a great many users who will be forced to use alternative highways. The large increase in the number of users of these alternative routes will force the roads into a state of congestion with traffic jams. Key trunk exchanges because of their complexity and rarity will be much more difficult to restore/replace than the local exchange.

In the metropolitan and large provincial centres, a similar but simplified form of switching hierarchy exists to that shown in Figure 3, with the role of the second level of exchanges (minor switching centres) being undertaken by tandem exchanges which then pass trunk calls to secondary and higher level exchanges. The inter-relationships are shown in Figure 4. Routing patterns can become extremely complex (Figure 5) and local switching and transmission path knowledge is required to determine the effects of failure, and to develop restoration strategies.

Redundancy/Duplication of Components - Benefits and Limitations

Exchanges in Telecom were originally constructed of "step-by-step" equipment. This equipment is in a stage of obsolescence and now comprises 14% of the total equipment. The equipment required for the setting up and terminating of the call was associated with the mechanical switches which were held during the total call. In the next generation of equipment it was recognised that this was an expensive and inefficient use of such equipment. These "cross-bar" exchanges utilised common control equipment, which could be accessed for setting up each call and then released for the next caller. Within the exchanges these items of common equipment are duplicated so that failures will not adversely affect the standard of service. Other important items of equipment such as tone generators and ringers are also duplicated. Whilst the commercial electrical mains supply is normally used where available for powering telephone exchanges, large repeaters etc., this facility is

backed up with battery installations to cover several hours of electrical mains failure. Power plant is also duplicated in significant installations with main and standby diesel generators.

These redundancy measures are taken to combat the usual failure situations which confront Telecom. It would be prohibitively expensive for example to build the same sort of redundancy/reliability that is used in the design of satellite transponders or submarine cable repeaters where their inaccessibility demands a more rigorous approach. Thus these measures do have their limitations. It was found during the Tasmanian bushfires in 1967 that due to the failure of the commercial mains supply, isolated small telephone exchanges quickly exhausted their stand-by battery supply, due to the high calling rate of subscribers during the disaster, and the consequent high power drain.

General Measures taken by Telecom to protect against Earthquake, Flood, Wind and Fire in the Planning and Construction of its Buildings and Telecommunications Plant

Earthquakes

In so far as Telecom is concerned, special measures to design buildings resistant to earthquake are taken only in Western Australia. For those significant buildings within the fault region, such as the important Wellington exchange, the design is in accordance with AS 2121 - "Design of Earthquake Resistant Buildings" in regard to foundations and general structural coherence. In fact the Wellington exchange design was the subject of special arrangements to ensure that if a severe earthquake occurs, all communications equipment and power/battery room equipment are tied together in a manner to prevent impact or puncture shear loads from occurring.

Most radio communication structures are fabricated by a bolted lattice construction, not masonry clad, and in the event of earth movement, some slippage at joints can occur without causing the structures to fail. Siting of towers/structures takes into account known hazardous regions where such action is not constrained by transmission requirements. The siting of the towers associated with the gas pipeline project Perth-Karratha in Western Australia has avoided known earthquake fault lines wherever possible.

Damage suffered in the past by Telecom as a result of earthquake has been minimal. Damage suffered to buildings (including those in Perth and Bunbury), exchange equipment, trunk routes and customer's telephones as a result of the

Meckering earthquake was less than \$30,000 at 1968 prices. At the actual earthquake fault the ground movement caused the pole route to subside nearly 2 metres, and the aerial lines to sag to ground level.

Floods

Flood is considered to be the most common enemy to buildings. Normal building practices are applied to all Telecom buildings; it is generally considered impractical to design buildings which have openings in them, against flood water ingress.

Cable chamber construction represents the most expensive item of Telecom construction in relation to the endeavours made to prevent seepage of ground water.

The best safeguard against flooding is to locate buildings clear of known flood prone regions, but this may not always be practical due to heavy cable reticulation costs. The floods which occurred in Queensland early in 1974 were the most severe and widespread for many years. Engineering planners had located all major exchanges in the Brisbane metropolitan area above the record flood heights set in 1893. As a result, no exchange suffered damage.

Radio communication structures are fairly immune from flood problems for the same reasons as described for earthquakes. When unavoidably, construction is required in a known flood prone region, proper engineering precautions are adopted. One particular aspect is the necessity to consider buoyancy problems associated with concrete footings as towers have been known to "float" out of position.

It is a far more common occurrence to experience flooding of broadcasting (MF) sites than it is for TV/FM sites due to the primary considerations of signal propagation made for the siting of the respective installations.

Telecom's aerial construction is not as prone to flood problems as it is to fire and high wind. During the 1950's and earlier, main cables which were lead covered and had paper insulation around the conductors were very susceptible to water ingress through sheath fractures and poorly sealed joints. These days the main cable networks are well sealed with dry air at a pressure at the injection points of 70 kilopascals. Thus main cables can be covered by several metres of water for days on end without deterioration to the paper-insulated conductors. This was also demonstrated during the Brisbane floods of 1974. It has proved impractical to seal the small distribution cables and this part of the network is susceptible to water damage.

Flooding and scouring in river beds, washaways etc. is a source of problems to Telecom's underground cable system from time to time. Trunk cables and/or the conduits in which they are housed are laid at a depth of at least a metre in hazardous areas, but scouring up to 3 metres is possible.

The alternative to underwater crossing is to locate the cables on substantial bridges where they exist. Even in these locations the cables are not necessarily safe as there have been occasions when disasters have affected bridges carrying important cables, for example, the Granville Bridge train disaster and the Derwent Bridge ship disaster. On the latter occasion a 600 pair cable on the bridge was broken but the submarine cables alongside were unaffected.

During construction of the co-axial cable route from Broken Hill to Cobar "islands" were built in known flood plains to accommodate the jointing chambers above previously recorded flood levels.

High Wind

In those areas of risk, Telecom policy in relation to cyclones is to identify the hazard by a classification of its building construction. The area of risk is bound by the coastline north of latitude 27°S and extending inland for a distance of 50 kilometres.

Telecom uses two (2) classifications for its building construction viz. Class A and Class B.

Class A buildings/structures are those required essentially to perform post-disaster functions and which must remain operational during and after a cyclone, eg. communications buildings, broadcast and television buildings.

Class B buildings are those that have no post-disaster functions, eg. training centres, administrative buildings.

All Telecom structures are built to accord with SAA specifications including AS 1170 Part Two - Wind Loading Code. In the area north of latitude 27°S a return period of 100 years for Class A buildings and 50 years for Class B buildings is used.

Walls, roofs, doors and window screens of Class A buildings are designed to fully resist penetration by impact from debris. Current requirements call for designs to resist impact by a piece of timber 100 mm x 50 mm x 3 500 mm long, mass 4 kg, striking end on at 20 m/sec.

Roof design features in Class A buildings ensure positive water tightness by the provision of reinforced concrete ceiling slab or the use of materials that are capable of resisting impact by flying debris.

Walls have to guarantee integrity and in most cases are either reinforced concrete or pre-cast concrete as traditional masonry is normally incapable of resisting impact of debris. All windows are protected by external screens or have special glazings such as polycarbonates.

In the prescribed cyclone zone new radiocommunication structures are designed in accordance with Australian Standards Code requirements. More than 95% of existing structures fall well short of the Code requirements, but continue to serve Telecom well even after 50 years of service.

As a secondary consideration sensitive elements of these structures, such as feeders, are given some structural protection. This protection is provided by encasing the feeders in a wire mesh up to a height of twenty metres. Additional bracing arms are fitted to dishes mounted on towers in cyclone areas.

Telecom's aerial construction is subject to high wind damage but pole routes are becoming much less significant as a proportion of Telecom's external plant reticulation, as shown in Figure 6.

One could be forgiven for believing that underground cable reticulation would be immune from cyclone damage. However, during the clean-up operations following Cyclone Tracy in Darwin, 1974, cable-pillars, cable-boxes and other above-ground plant became entrapped in debris being bulldozed together for removal.

Figure 7 summarises the damage incurred to telecommunications following Cyclone Tracy, which imposed the most severe test ever experienced in Australia. It is commendable that at least part of the local network, namely the microwave radio system, continued to operate throughout this period when all the other parts of the network were rendered inoperative to varying degrees. It becomes apparent from a study of Figure 7 that the majority of internal plant failures resulted from the inability of the building structures to withstand the forces imposed by winds of up to 250 kilometres per hour.

Fire

Construction of Telecom buildings in relation to fire, is carried out in accordance with Telecom Guidelines which are acknowledged as being of a high standard, and which are

adopted frequently by private enterprise construction authorities. These guidelines are generally in excess of the requirements of local State Regulations.

Telephone exchanges are built of incombustible materials with fire retardant partitioning to contain fires for up to three (3) hours. Buildings in general are given fire ratings in a classification scale numbered one to five, with one being the best rating. All Telecom structures (except the small rural exchanges) are classified as rating one (1).

One of the factors recognized as constituting a hazard to Telecom's rural exchanges and depots is the growth of vegetation in close proximity to buildings. There is also a need to keep all building gutters clean and telephone exchange yards free of debris. Appendix 1 is a report issued following the major bushfire in the Adelaide Hills of February 1980. It demonstrates the need to balance aesthetic and environmental considerations with survivability considerations, and that usually an integrated solution can be achieved.

Long term experience has indicated that buried cable plant is far less vulnerable than aerial plant in fire-prone regions. Preservative treated poles are considered to be less prone to fire damage than untreated timber poles, although salt-preservative treated poles have been found to perform poorly in bushfires. However, on economic grounds aerial cable construction is often preferred to underground cable installation in heavily timbered mountain regions in remote areas.

A shroud for the above-ground joint post, which is used frequently in rural areas, was recently designed to give the joint some protection in the event of exposure to heat from fire. These shrouds are made of thick PVC and are sacrificial in effect. They have been field trialed in Victoria and South Australia where they performed satisfactorily under bushfire conditions.

Design of Telecom network in Terms of Traffic Handling Capacity - effect of Overloads - Limitations of Existing System

Local Network STD Network Manual Assistance

The provision of circuit quantities in the Telecom network is based on historical measurements and forecasts of the likely demand. The purpose of the measurements is to assess for each particular exchange, its time consistent busy hour

for the busiest calendar month. Figure 8 shows typical seasonal variations of telephone traffic over a year from different metropolitan terminal exchanges. These procedures give as good a guide as practicable to the likely user demands on the system, but there will be occasions when the circuits provided cannot match the traffic generated by customers. Examples are:

- i. concessional night STD tariff rates generate a heavy customer demand after 9 pm;
- ii. radio and TV quizzes or surveys on topical items can generate a heavy calling rate to particular telephone numbers;
- iii. during and following a disaster, there can be a high calling rate by the public to determine the state of health of friends and relatives.

The result of these effects is congestion in the networks. In addition the failure of a key item of equipment can also cause the same overload effect.

Modern telecommunications networks utilising common control equipment and alternate routing quickly degenerate into a state of congestion and inefficiency when the load offered exceeds the design load. This is illustrated in Figure 9. Calls normally requiring only one link are occupying several links and the flood of calls from these direct links can swamp the calls normally using the alternate routes. Holding times on the common control equipment become excessive as customers reattempt their calls.

In the local exchanges, customers may experience difficulty in obtaining dial tone. If successful at this stage, there is the high probability of obtaining congestion tone on dialling the digits, or being referred to a recorded voice announcement which requests them to delay their call.

Many customers faced with this frustrating situation, call manual assistance to place their trunk call. However manual assistance operators are usually in no better position to successfully make a call than the customer dialling STD. National usage of STD is 98% and Telecom has geared its facilities and staff to the relatively low usage of the manual assistance facility. They are therefore unable to cope with the increased load of traffic from customers seeking an alternative to the STD network.

Where there is localised congestion, relief can be achieved for a few individual important services by providing exchange services from a nearby exchange. With the advent of the

Mobile Telephone System in Sydney and Melbourne this capability is considerably enhanced for those areas, and was used with great success during the recent Victorian bushfires to provide a communication link into the switched network from the devastated areas. The facility will be available in Brisbane, Perth and Adelaide by June 1985.

It is also possible to reduce the influx of calls to disaster affected areas by setting up enquiry phone numbers at locations where there are ample facilities, and ensuring that these locations are provided with up-to-date information using dedicated communication links from the disaster area.

It has been Telecom's experience during previous disasters of some magnitude that the use of the telecommunication system increases dramatically. For example the bushfires in southern Tasmania of the 7th February 1967 resulted in telegraph traffic over the period 8th to 11th February rising from a daily number of telegrams of approximately 2000 to a figure of 10,000.

In the South-Eastern Queensland Floods of 1974, approximately 30,000 telephone services were out of order. A significant amount of congestion was caused through customers trying to reach these telephone numbers for which there was no possibility of making a successful call.

In the Victorian fires of February 1983 an analysis of telecommunication traffic flows on the day after the fires indicated that there were widespread reports of "no dial tone" from metropolitan exchanges. The Windsor secondary trunk exchange handled 1.26 million call attempts compared with 0.4 million normally of which 41.6% were unsuccessful due to no circuits being available. On routes to fire affected areas such as Emerald, Lilydale, Pakenham and Ferntree Gully the success rate was about 12 calls in every 100. The Lonsdale main trunk exchange handled 1.46 million call attempts compared with 0.4 million normally of which 34.7% were unsuccessful due to no circuits being available.

Organisational Arrangements for Disaster Control in Telecom's Headquarters and State Administrations

In most of Telecom's state administrations an organisational arrangement very similar to that shown in Figure 10 for Western Australia is brought into effect when a large scale emergency is imminent or has occurred.

In Telecom it is the Operations Department which is responsible for restoration of customer equipment, local and trunk networks, except where a particular facility is maintained by the Engineering Department. Thus the establishment of the Local Emergency Control Centre (Emergency Restoration Centre - Qld) is the responsibility of the District Telecommunications Manager in the affected district. The role of the

Centre is to handle all reporting, assess the extent of damage and co-ordinate all restoration activity within the District. A communications link will be established to the Service Restoration and Traffic Control Centre (SRTCC) located in the state capital, and emergency communications are maintained with the affected area within the District. Contact is maintained with local civil authorities and their emergency communication needs determined.

The SRTCC is a continually functioning unit of Telecom. There is one centre in each state capital, and a national SRTCC located in Telecom Headquarters, Melbourne. The function of the Centre is to optimise the use of the immediately available transmission capability for handling "network traffic" when there are major plant failures or overloads. The SRTCC is not involved in the maintenance repair activity of facilities, but provides the restoration contingency plans and procedures and status reporting to management. Depending on the extent of a disaster, the usual SRTCC staff could be augmented by additional engineering staff.

During normal working hours the state SRTCC will be the contact point within the state Capital administration for advance information on an impending disaster or the occurrence of a disaster. Its function is to advise senior state management who decide whether in the circumstances to establish an Emergency Council (Disaster Co-ordination Council - Qld) and an Emergency Co-ordinator or Co-ordination Group.

The role of the Emergency Council is to co-ordinate the activities of the various Departments and autonomous Branches within Telecom and liaise with top management in Telecom Headquarters. The Council members will usually include the State Manager, the Chief State Engineer and the Chief Operations Manager.

The Emergency Co-ordination Group provide the interface between the disaster site Control Centre and Telecom management for resource support and policy guidance requests.

The Group comprises engineering managers co-opted from normal duties, as appropriate to the particular disaster, who:

- * report directly to senior state management
- * give advice on ways and means to provide emergency local communications
- * advise the affected Centre on action to be taken to establish emergency trunk communication

- * co-ordinate the supply of resources from within the Engineering Department
- * specify action to be taken to restore basic trunk facilities
- * liaise with the State Counter Disaster Organisation.

The state SRTCC via the national SRTCC keeps Headquarters management briefed on developments. Requests for assistance from the Natural Disasters Organisation are channelled into Telecom at the Headquarters level to the Superintending Engineer, Network Operations.

An Emergency Services Liaison Officer (ESLO) is nominated in each State administration of Telecom for ongoing liaison with the State Emergency Services. Frequently the ESLO has line control of the SRTCC in the organisation of Telecom.

The commitment by Telecom's state administration to pre-planning appears to be predicated on the extent to which the State Emergency Services relies on Telecom to actively participate in its communication arrangements.

The Victorian administration of Telecom is heavily involved in and committed to DISPLAN, and its various planning committees. An overlay functional line of control has been established in which the State ESLO reports to the State Manager and is supported by an Emergency Services Liaison Officer in each Disaster Region. This arrangement overcomes problems which would otherwise arise from the non-coincidence of normal administrative boundaries of Telecom with those of other emergency service organisations.

The physical preparations take the form of a pre-planned network of nominated (but not dedicated) trunks and junctions, together with facilities for flexibly interconnecting these to provide point to point telephone services employing magneto signalling, as illustrated in Figure 11. The format of the trunk and junction network is based on the foreseen operational needs of the services concerned and for the co-ordination organisations of DISPLAN. Provision is also made for the extension of these circuits to the premises of the emergency services concerned, one of the planning objectives being to ensure that all temporary cross connections or patches are necessary only at continuously staffed centres. Pre-wiring of fixed and mobile disaster control headquarters (Police, Country Fire Authority, State Emergency Service, etc) is done only in State Headquarters. At the Regional level only a few subscribers pairs are provided to the premises, local hall or school, and temporarily wired as required. Further preparations consist of emergency kits distributed around the country and metro areas which contain magneto telephones (table and field),

wire, cable, terminal blocks, batteries and signalling, as illustrated in Figure 11. The format of the trunk and junction network is based on the foreseen operational needs of the services concerned and for the co-ordination organisations of DISPLAN. Provision is also made for the extension of these circuits to the premises of the emergency services concerned, one of the planning objectives being to ensure that all temporary cross connections or patches are necessary only at continuously staffed centres. Pre-wiring of fixed and mobile disaster control headquarters (Police, Country Fire Authority, State Emergency Service, etc) is done only in State Headquarters. At the Regional level only a few subscribers pairs are provided to the premises, local hall or school, and temporarily wired as required. Further preparations consist of emergency kits distributed around the country and metro areas which contain magneto telephones (table and field), wire, cable, terminal blocks, batteries and signally conversion relay sets.

In contrast, the New South Wales administration of Telecom does not have an elaborate system of documentation and relies on local contact at the District Telecommunication Manager level, backed up by Engineering Department resources on request through the State Emergency Services Liaison Officer.

Equipment held for emergencies

Telecom is mindful of the fact that equipment held only for emergencies tends to become forgotten, obsolete or inoperable due to dust, lack of lubrication or oxidation. Sometimes the equipment is cannibalised for useful parts or damaged and is therefore generally unreliable. Nevertheless it is considered that certain items of equipment should be held, regularly used or tested and examined and be immediately available in case of emergency.

No equipment is held by Telecom Headquarters; its function would be to co-ordinate interstate transfers if the capacity within the state was insufficient. It should also be recognized that due to Telecom's heavy capital works programs there is always a variety of modern equipment in store awaiting installation which could be utilised for emergency purposes. There is also a variety of equipment being refurbished in Telecom workshops. In addition, there is a range of spare plant, mobile power generators etc, which is available for servicing the normal operating network and may be utilised during disasters. A recent survey of state administrations of equipment held for emergencies yielded the information shown in Appendix 2.

Thus all the mainland states have been provided with transportable emergency broadband radio equipment which can

be used to bridge a major coaxial cable or radio bearer failure by providing a temporary link between two suitable points on each side of the failure. The capacity of the equipment is rated as 1800 VF channels or one video program.

Telecom has the capability to transport and install small exchanges (up to 1000 lines) to areas where telephone exchanges have been destroyed, or possibly to a new location. In a disaster exercise conducted in SA/NT in September 1982 a 400 line workable telex exchange was compressed into a package sufficiently small to be transported by cargo aircraft. This exchange was transported by a RAAF Hercules from Adelaide to Darwin and then installed, tested and commissioned. The exchange left Edinburgh Base on a Sunday, was unloaded in Darwin on the Monday and was operational 36 hours later.

Future Plans for improving capabilities

i. Emergency UHF Radio Equipment

A contract has been issued with Siemens for small capacity radio emergency equipment which will operate in the 900 MHz band and provide a nominal capacity of one 60 VF channel supergroup. Delivery of this equipment is expected to start in January 1984.

Each State (except WA which already has the facility) will have a complement of four transceivers, but Queensland, because of its large area, will be provided with double this quantity. The equipment includes collapsible masts and folding antennae, is readily transportable and can be set up in a matter of hours. It will be held in store until it is required for an emergency, and if necessary, it will be transported from one State to another.

The radio equipment can be connected in series or in parallel, as the situation requires. Half of all the transceivers will also be equipped with 12 channel sub-baseband multiplex equipment together with terminating relay sets which will allow a direct connection of up to 12 telephone services. In addition, there is also an orderwire facility supplied with each transceiver.

The 60 channel supergroup occupies a baseband of 60-312 KHz, but each unit will be equipped with a translation unit which will convert this baseband signal to and from supergroup No 2 in the CCITT Modulation Plan No 2, which covers a frequency range of 312-548 KHz. This will allow the radio equipment to be interfaced to standard carrier equipment.

ii. Satellite Emergency Transportable 12 channel (2Mb/s) systems

Telecom's plans to use the Australian Domestic Satellite commencing June 1985 include the purchase of small capacity radio equipment from NEC in the form of five transportable earth stations. The earth stations will be available for emergencies such as natural disasters, or to provide immediate relief for a sudden anticipated surge in demand such as a new mining discovery in a remote place. The equipment is modular in construction and capable of providing for 2Mb/s transmission or 1 to 12 voice channels, depending on the number of modems provided. Each modem in effect generates a separate carrier signal and therefore the power consumption will range from 260 w to 1.5 kw depending on the number of channels equipped. The equipment will operate in the 14 - 14.5 GHz band for the up-link and 12.25 - 12.77 GHz for the down-link.

The equipment can be operated in a point-to-point mode or to gain access to the Telecom switched network via the Remote Telecommunications Satellite Service Exchange control facility located at Bendigo Victoria. It will therefore have a significant effect on Telecom's ability to respond to requests for circuit provision in remote areas following a disaster.

The equipment is readily portable with the possible exception of the 6.5 metre diameter dish which comprises 12 separate petals. The large dish could take up to two days to assemble on site, although in the meantime the smaller 3.7 metre diameter dish could be providing a lower capacity of operation. Alignment of the antenna with the satellite can be done in a short period of time (1/2 hour) by trained personnel.

iii. Improved diversity for isolated but important areas

Telecom intends to devote more capital over the next few years to improving the diversity of the network to isolated but important areas.

Currently failure of the Darwin - Townsville or Perth - Adelaide broadband links leaves Western Australia and the Northern Territory practically isolated from the rest of the Australian continent, apart from a few emergency circuits dependent on open-wire aerial routes. Broadband diversity in the form of a 960 channel radio bearer is needed to provide more adequate communications in the event of such a failure.

This can be achieved by "closing" the loop between Katherine (NT) and Kununurra (WA) where there is currently no broadband capacity, and building up sections of the route which have insufficient spare capacity to make the most effective use of the alternative routing which results. The objective is to have the diverse route operational by the end of 1986.

Also, at present there is no broadband link connecting the north and south of the country through the middle of the continent. A new link between Port Augusta and Alice Springs would complete the north-south connection and give considerable flexibility in diverting traffic in the event of failures on other routes. This route is planned for provision in the period 1985-1990.

In addition, many important centres have access to their parent exchange by only one broadband route. Diverse routes are planned for some of these centres to give more flexibility. For example, provision of a broadband link between Moruya and Bega in NSW, would provide diversity of routing for the southern NSW coastal centres including Wollongong, either through Sydney or Canberra.

iv. Switching diversity enhancements

There are a number of proposals to improve switching diversity and therefore improve the network's resilience to failures or overloads.

Telecom's trunk network has evolved as a combination of the star and mesh network concepts, because this represents the most economical manner of achieving switching and routing of telephone traffic. The star network relies heavily on each part of the network trunking to a complex centrally located switch and achieves economies in the efficient use of a few heavily trafficked routes. It is vulnerable to failure of the central switching machine. The mesh network generally involves smaller routes between all exchanges and these routes are less efficient and less flexible in traffic handling capability. However, the network is inherently more survivable in the event of a single exchange failure. It has been demonstrated in the past that our presently designed network is vulnerable to traffic overload through failure of key network components. It is strategically unwise to rely too heavily on one switching centre with its very heavy concentration of traffic, despite the fact that in normal circumstances this is the most efficient and flexible technique. Telecom, therefore, proposes a shift in emphasis be made to design a less vulnerable network by overlaying some mesh trunking links on

the present network.

In metropolitan networks selected terminal and/or tandem exchanges will be provided with direct routes to distant major trunk traffic destinations. In country networks by pass routing will secure access between the major local community of interest and to the capital city and beyond.

Certain secondary centres will be upgraded to primary centre status. There are a number of important trunk switching locations at the confluence of transmission facilities where the advantages of raising the secondary switching centre to primary status would provide the opportunity for additional originating and terminating traffic options for a geographic area - particularly to interstate destinations. The establishment of these centres would reduce the country area dependence on the capital city trunk exchanges for interstate traffic and in some cases for international traffic.

The Telecom switched network employs alternate routing ie., there are direct routes between exchanges as well as alternate routes through further switching stages. The direct routes are designed for a high occupancy (and therefore high efficiency) of the links.

Under periods of normal heavy traffic it is arranged for overflow to take place to alternative second or third choice routes. These latter routes are therefore carrying small parcels of traffic from different origins. Should a direct route carrying normally a considerable amount of traffic sustain an abnormal overload condition, the overflow traffic would swamp the normal small parcels of traffic on the alternative routes. The overload could be caused by the failure of an exchange or transmission link elsewhere in the trunk network, which results in a high level of repeated call attempts by subscribers to the affected location. Telecom therefore proposes to provide additional capacity to allow for the smaller parcels of traffic to be protected from the possible overflow from large traffic routes.

v. Diversity for international traffic

While the local and national calls combined increased by 30% over the last 5 years, the outgoing international telephone calls increased by 300%. This small but increasingly important component of traffic should be provided with sufficient diversity to ensure effective operation at all times. Figure 12 shows typical trunking arrangements for international traffic and the diversity currently provided.

A weakness in the trunking of originating traffic is that Perth, Adelaide and Brisbane are reliant on a single 10C trunk exchange in each city for international calls.

The situation could be improved for ISD (International Subscriber Dialed) calls, as charging is uniform around Australia. The trunking is to be re-arranged so that in the event of a local 10C exchange failure, international traffic is routed to another State's 10C trunk exchange and thence to the Overseas Telecommunications Commission (OTC) gateways. The proposed trunking is shown in Figure 13. This scheme will operate on an interim basis until the new digital trunk tandem exchanges are installed. These exchanges will be equipped with ISD/CCR (call charge recording) capability and provide direct routes to the OTC gateway exchanges.

vi. Diversity for manually assisted trunk traffic.

There are several factors leading to a reduction in the significance of manually assisted trunk traffic. Telecom actively encourages its customers to dial their own trunk calls. 83.6% of national trunk calls were dialled in 1977, and by June 1981 this had increased to 92.6%. ISD (International Subscriber Dialling) was introduced in 1976 and continues to expand at 50% per annum. At present 43.8% of international calls are directly dialled by subscribers with an estimated penetration of 75% by 1985.

It is expected that by 1985 manually assisted trunk traffic will comprise only 1-2% of the subscriber dialled traffic on Telecom's main trunk routes and Telecom will have dimensioned its networks and facilities accordingly.

The capability of the manual assistance network to cope with failures of the STD/ISD network is therefore very limited.

During periods of abnormal congestion in the trunk network, subscribers place greater reliance on the manual assistance network as a more certain way of achieving call completion than by STD/ISD and the network should be made as efficient and effective as practicable during these situations.

Telecom is also progressing as quickly as possible to standardise manual operating facilities on 10C equipment (Main trunk exchanges in the capital cities).

The switchboards of this type incorporate display screens, automatic timing and charging and a number of other features which significantly improve the efficiency with which traffic can be handled.

One of the disadvantages of this standardisation is that the diversity previously provided through a variety of manual operating equipment and arrangements will be lost unless special measures are taken.

In those State capital cities where there is more than one 10C trunk exchange installed (Sydney and Melbourne) diversity for manually assisted traffic can be achieved by adopting the trunking configuration shown in Figure 14. Thus failure of one switching machine or one centre will not prevent subscribers from obtaining trunk operator assistance, although with reduced availability.

In those State capital cities where there is only one 10C trunk exchange installed and planned (Brisbane, Adelaide and Perth), diversity considerations are more complex and the matter is under active study.

vii. Service Protection Network (SPN) Concept

This concept, adopted by Telecom recently, proposes that the transmission network linking major capitals be protected by transmission links dedicated for protection purposes. For example if the Sydney/Melbourne coaxial cable fails, the dedicated protection links would be switched to provide alternative links until the fault was fixed. The objective is to provide sufficient dedicated links such that 90% of normal telephone circuit capacity can be restored in the event of any single outage. The protection links would include radio protection bearers which are normally provisioned as part of a broadband radio system. In the longer term, reaction times would be reduced to a few minutes by automatic patching using protection links under computer control.

Taking the 1985 situation for the Sydney-Brisbane links which are provided by radio and cable via Newcastle and Dubbo (Figure 15) the surviving capacity is as follows:

Sydney-Brisbane	No. of Working Assemblies of 900 telephone circuits			No. of SPN Assemblies	
	Radio	Cable	Combin- ation	Total	
Via Dubbo	0	0	6	6	0
Via Newcastle	3	0	2	5	6

	Assemblies Lost	Capacity Surviving
Complete cable failure between		
Brisbane-Dubbo	6	100%
Newcastle-Brisbane	2	100%
Complete radio failure between		
Sydney-Dubbo	6	100%
Newcastle-Brisbane	3	73%

For this inter-capital link, the objective of 90% capacity restored is close to realisation.

viii. Network Management Controls

Those delegates to this study who may have read conference papers of similar studies emanating from the North American continent will have observed the importance placed by the Telephone Companies on techniques of network management when the telecommunications network is under stress. This stress can result from the failure of key installations during a natural disaster or from congestion resulting from the increased use of the network in specific areas by the public.

As used in North America, network management calls for the collection in real-time of large amounts of measurement data on the state and health of the network. When certain

preset thresholds are exceeded, network management actions are initiated to either limit the number of calls to the equipment available, or to re-route the calls to links and nodes where there is spare capacity, or vary functions and facilities available in the network.

In the past, Telecom has used relatively simple and fairly inadequate means to control traffic during network congestion or other emergency situations. These have included ad hoc procedures such as the blocking of inlets to an exchange in cases where the continued level of traffic would be likely to result in the failure of the exchange, or the connection of subscribers to recorded voice announcements advising them to delay calls if possible. During the recent Victorian bushfires Telecom staff intercepted conversations in progress to request early termination of the call.

Two factors underlie Telecom's past practice:

- * a natural reluctance by staff generally to initiate deliberate blocking-off of large groups of traffic, of which some calls could be in the emergency category.
- * a lack of the appropriate diagnostic and measuring equipment to enable control measures to be applied and effects monitored.

Since there is a high cost associated with the setting up of a sophisticated network management capability, it will be necessary to carefully evaluate the costs/benefits associated with the various network management actions before they are implemented in Australia. Last year, Telecom engaged AT & T International as consultants to study the New South Wales component of the network and advise on the possible application of network management techniques. During the study it became evident that, due to call establishment differences between the USA and Australian networks, it would not be appropriate to introduce the range of techniques used in the USA without further trial and evaluation. Consequently, the approach Telecom is adopting is to examine our needs, develop trials and assess a range of measurement parameters and control techniques.

One part of this assessment concerns the classification of telephone traffic into two streams - priority and normal. During a disaster priority traffic (police, fire, ambulance etc.) would be given unrestricted access to the network whereas normal traffic would be

matched to the resources available in a random manner. The matching process could be arranged for local or trunk calls depending on the congestion situations which prevailed. Thus the throughput of traffic would be increased over the present capability (in congestion conditions) and calls important for disaster control purposes would not be delayed.

Service Restoration Plans

Restoration of service following a disaster is generally effected in three stages:-

- i. Providing Emergency Communications. This is the provision of speech and/or telex services as required for the State Disaster Organisation between the affected area and Telecom control centres for highest priority customers.
- ii. Restoring Basic Facilities. This is the stage of temporary reprovision of service to public telephones and as many customers as possible. This should follow as soon as possible after emergency communications are established so that local and trunk connections can be arranged.
- iii. Restoration of Full Service. This is the permanent reprovision of facilities to give the same quality of service to the customer as before the disruption. New plant would probably be required which would be installed some time after the disaster.

It is recognised within Telecom that contingency and restoration plans require development to facilitate restoration procedures in the event of a disaster. The extent of this planning to date has been based on areas and localities at greatest risk. Thus the areas subject to cyclones in Western Australia, Northern Territory and Queensland have been the subject of extensive contingency planning whilst recognising Telecom's inherent resource depth to deal with crises utilising engineering and technical talents and equipment available at the time.

Cairns communication facilities

Telecom counter disaster planning has been based on a storm surge of 2.347 metres which would result in a peak surge of 0.61 metres above the ground floor of the Cairns Exchange. As the major portion of the switching equipment is on the ground floor, any water rise of more than a few centimetres would pose a serious threat. Local action has been taken to restrict or at least control the rate of

water entry including blocking sewers; water barriers in passageways; rebuilding of the front of the building to incorporate surge protection; additional sealing of doors; sealing of cable ducts; and provision of pumps.

The radio terminal in Hartley Street is even more perilously located with ground floor level 0.5 metres lower than that of the Cairns exchange.

Assuming a 5 metre storm surge it would appear that Cairns would be isolated from normal telecommunications facilities.

Adelaide communication facilities

Total disruption of all fixed and mobile communications within a 20 km radius of the city centre would encompass Telecom's key installations in Adelaide (see Figure 1) and virtually isolate the city. Damage on this extensive scale would mean that the majority of homes would be destroyed and efforts would be concentrated towards provision of emergency communication for disaster relief activities. It is likely in practical terms that, although communications are affected temporarily, the nature of the damage is such that communication facilities could be restored relatively quickly.

Victorian communication facilities

It is interesting to note that in the bushfire disaster in February 1963, Telecom did not lose any telephone equipment buildings in either Victoria or South Australia. Two exchanges were isolated in South Australia for about 24 hours due to the destruction of aerial trunk routes. In the case of one of these exchanges (Furner) there were only 8 customer lines still intact following the fire. There was of course damage to aerial plant, above-ground joints and other equipment above or near the surface in the two states, but the effect was almost exclusively felt on customers individual lines and had little effect on communications generally. As referred to earlier in this paper, communication problems in the Victorian bushfires resulted from the concentrated use in particular areas of the telecommunications network and facilities well in excess of normal busy periods. If there were key equipment failures during the period of a disaster the effects would be compounded.

Conclusion

Telecom has a vast network with a density pattern which generally follows population density. Significant improvements

have been made over the years in improving the survivability of the network against natural disasters and developing organisational arrangements within Telecom to cope with disasters and interface with emergency coordinators. The network copes very efficiently with the normal customer calling patterns, but can become heavily overloaded when failures of key components occur, or when customers dramatically increase their use of the system (which usually occurs during a significant disaster). Over the next few years Telecom intends to improve the capability of the system to cope with general overloads. Of particular promise is the concept of permitting emergency services unrestricted use of the Network, whilst limiting other callers in congested areas to the available communication resources. Nevertheless the most effective arrangement will remain the point-to-point permanent dedicated network with restricted access, and Telecom can assist in supplementing this with temporary circuits to a Field Control Centre.

VEGETATION NEAR COUNTRY EXCHANGES

Shortly after the bushfire, Engineering Department re-examined the subject of the clearance of vegetation and its environmental implications. Discussions were held between Telecom Australia, Mr N. Lothian (Director of the Botanic Gardens) and Mr. C. Harris of the Policy Division in the Department for the Environment.

The results of these discussions were as follows:

- * The vital role of the telecommunications network must be safeguarded in the first instance.
- * Telecom, partly because of its good standing in environmental matters, should endeavour to strike a balance between the legitimate community needs for communication and for a living environment.
- * Tall native vegetation should not be in the vicinity of our vital installations in areas of known bush-fire risk. While individual circumstances must be treated on their merits, it would seem to be essential to keep tall vegetation 10m to 30m away from our buildings (except for odd trees).
- * Cypress trees are much more dangerous than pines and should not be entertained within the vicinity (say 30m) of our exchanges etc. Pines do not carry a fire with any great strength, but cypresses are fuel centres which feed fires. (however, dead pines - from whatever cause - are dangerous for carrying a fire).
- * On roadsides, vegetation can be removed for fire break purposes under a State Statute (local council agreement) for a distance of 3m from a fence-line and Telecom should consider this in relation to its particular locations; but only adopt where absolutely necessary.
- * In high rainfall areas - ie. the Adelaide Hills - a typical solution could be 8m to 10m of lawn around a building then a belt of deciduous shrubs of adequate width - ie. commensurate with the nature and density of surrounding scrub.
- * Exotic deciduous shrubs will not carry a fire to same extent as native vegetation and would not be out of character with the landscape evolution of the Hills.
- * For firebreak purposes, a 1 1/2m to 2m band of lucerne around the boundary can be very effective as a fire

'dampener' in rainfall areas down to 500mm annual rainfall. This could be useful in locations where tall grass dominates (eg. a SCAX in a wheatfield). But annual costs would need to be considered.

- * Fuel 'de-loading' of debris - including a distance beyond the perimeter of our sites - should always be a consideration, but care should be taken if burning is used as the understorey could be completely lost within a few years. Probably best to do this in late Autumn to ensure that understorey plant species could regenerate. (NB. 'Controlled burning' is not yet a refined technique for SA conditions but trials are to be put in hand).
- * On the matter of possible heat damage to underground plant from burning roots, Mr Lothian said this is not likely for any living trees. However, dead trees/stumps - whether from a previous fire or other causes - would constitute a real threat and we should be prepared to remove any such hazards in the immediate vicinity of important underground plant. Mr Lothian thought it would be sufficient for large trees/stumps to be removed to just below ground level and thoroughly covered over with compacted soil.

Both Mr Lothian and Mr Harris offered to make consultants available to Telecom. Engineering Department has recommended that in the first instance Telecom should clearly identify vulnerable sites in SA then formulate first order solutions involving local councils and adjacent landowners as appropriate. If commonsense suggests that any of the proposed solutions are environmentally sensitive, or if agreement can not be reached with the local people concerned, then Telecom should seek advice from the Department for the Environment.

These views have been transmitted to the Operations Department and the current (March 1980) situation is that DTM's have been directed to review their installations along the above guidelines. If the guidelines are not appropriate for a particular situation, the matter should be referred to the Department for the Environment through Mr R. Shinkfield of the Planning and Programming Branch.

With reference to the paragraph on cable damage from burning roots, Adelaide South District offers the following comments:

The resources required to inspect all cable runs (subs and junction) in the hills area and carry out regular inspections would be hard to justify. However, it may be worthwhile for the action to be carried out for important

cables (junctions and coax which are mainly Cable Protection's responsibility). The risk for subs cables could be tolerated because most cables (subs) in rural wooded areas are probably 100 pairs or less, thus making the repair time relatively small. The Stirling fire produced only six in length faults due to heat damage and only two or three would have been due to burning roots.

EQUIPMENT HELD FOR EMERGENCIESNew South Wales:

- * Transportable broadband radio equipment (up to 2700 channels) and antennae; four transceivers (no multiplex or channel facilities)
- * Lengths of submarine and coaxial cable (but no special stock of "plough" cable)

Victoria

- * Apart from the DISPLAN kits of magneto 'phones, wire, tools, etc. stored in telephone exchanges, no special equipment is kept. There is a growing use of Telex and facsimile facilities and a reserve of Telex modems is being accumulated to permit the use of Telex over a telephone service with interconnect facilities at the Telex exchange to permit access to the Telex network.
- * Transportable broadband radio equipment (up to 2700 channels) and antennae; two transceivers.

Queensland

- * Each district has the usual range of mobile generators and lighting equipment.
- * Queensland Auxiliary Radio Network provides limited HF radio contact with key centres and outposts.
- * Transportable broadband radio equipment (up to 2700 channels) and antennae; four transceivers.

South Australia

- * Transportable broadband radio equipment (up to 2700 channels) and antennae; two transceivers.
- * A 1000 line ARK-D (Rural Automatic Exchange)
- * Two 40 line B type RAX (Rural Automatic Exchange)
- * An 80/120 line PMBX Switchboard
- * A 12/12 Carrier system with associated line equipment
- * A 120 channel carrier system

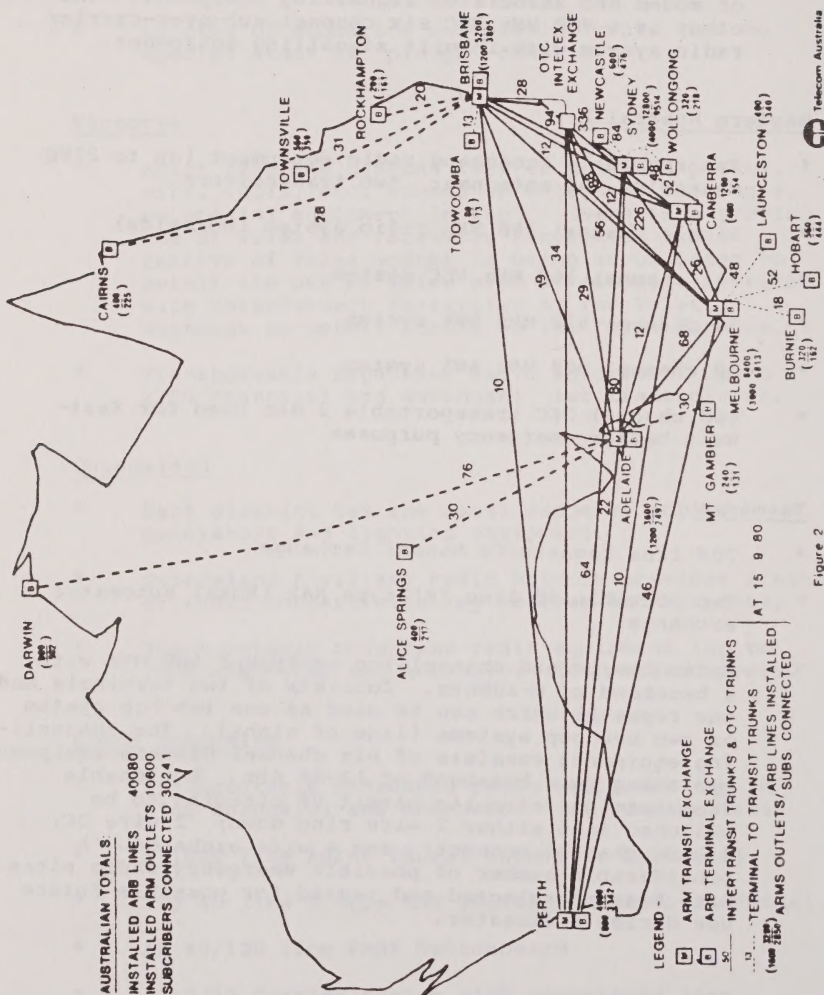
- * 78 pairs of relay sets to allow switchhook signalling over carrier
- * Two 6 circuit portable radio systems and associated signalling equipment for point to point communication or access to the network by telephone or telex. One is a 470 MHz Siemens Radio system with six channels of modem and associated signalling equipment. The other is a 900 MHz NEC six channel sub-over-carrier radio system with inbuilt signalling equipment.

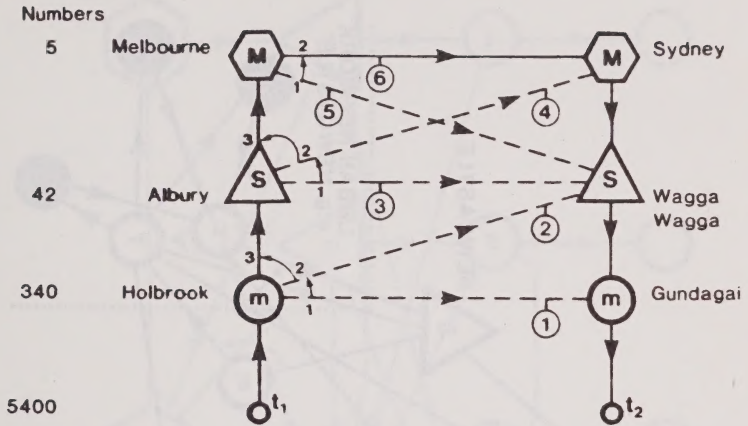
Western Australia

- * Transportable broadband radio equipment (up to 2700 channels) and antennae; two transceivers.
- * Single channel 160 MHz radio system (Wormalds)
- * 2x1 channel 160 MHz NEC system
- * 24 channel 500 MHz AWA system
- * 60 channel 900 MHz AWA system
- * 600 channel GEC transportable 2 GHz used for East-West bearer emergency purposes

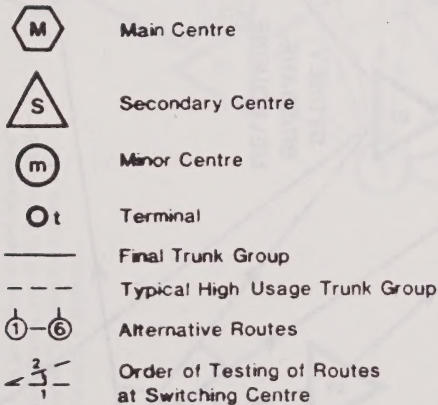
Tasmania

- * 200 line Magneto/CB Manual Exchange
- * Two portable 45 line "B" type RAX (Rural automatic exchange)
- * Radio bearer and channelling equipment 400 MHz with a baseband of 6-108KHz. Consists of two terminals and one repeater which can be used as one two hop system or two one hop systems (line of sight). The channelling equipment consists of six channel Siemens equipment operating on a baseband of 12-48 KHz. Switchable drop terminal circuits permit VF circuits to be switched into either 2 wire ring down; 2 wire DC; 4 wire channel connect; and 4 wire exchange. A considerable number of possible emergency radio sites have been preselected and tested for possible future use during a disaster.



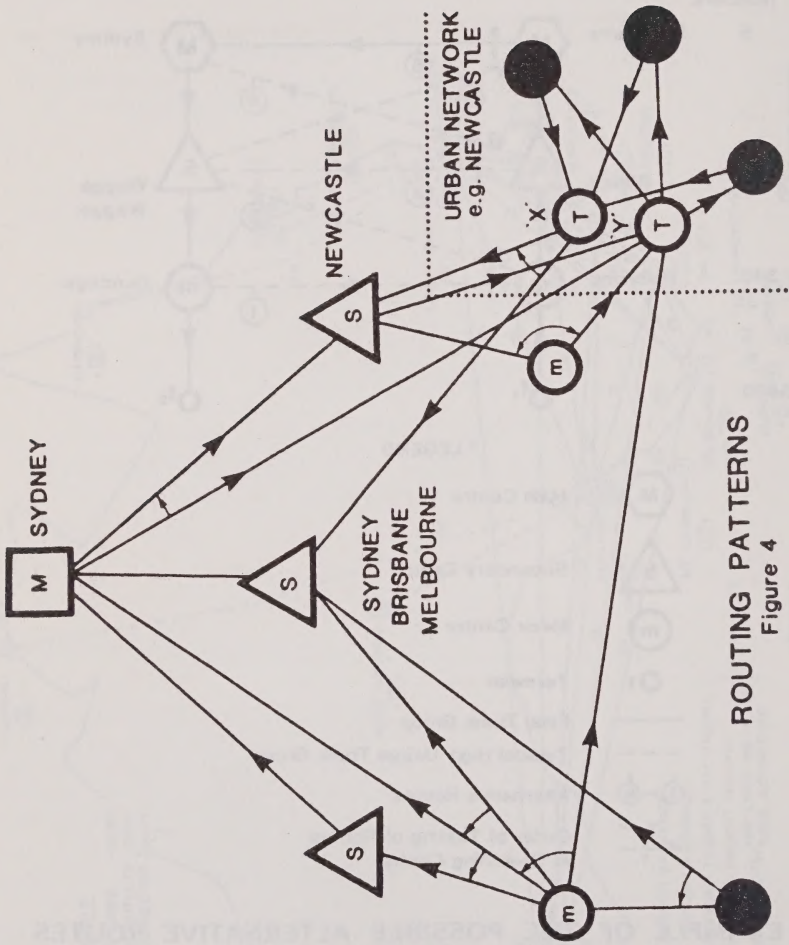


LEGEND



EXAMPLE OF THE POSSIBLE ALTERNATIVE ROUTES
(6) ON A CALL FROM t_1 TO t_2

Figure 3



ROUTING PATTERNS
Figure 4

Notes

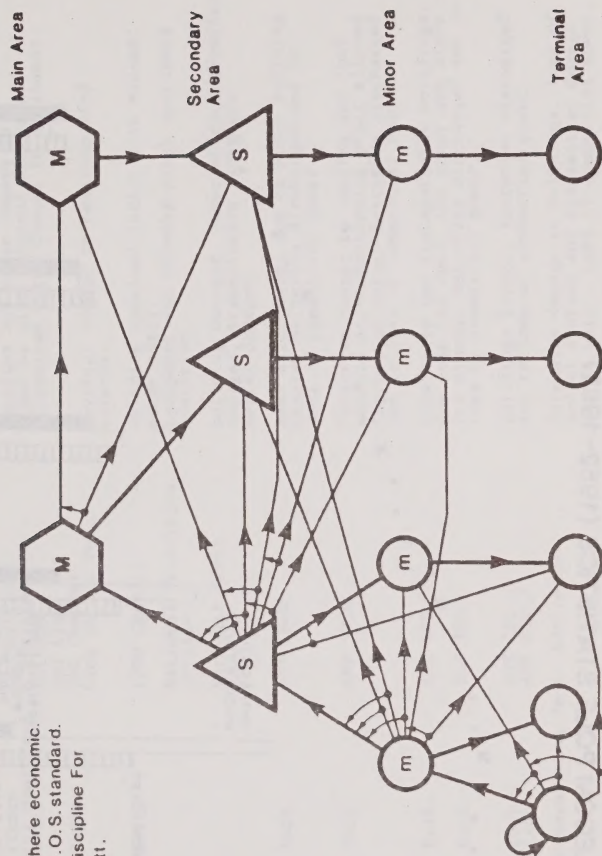
The diagram represents all the preferred switching options.

Routes are only provided where economic.

All final choice routes are G.O.S. standard.

For details refer "Routing Discipline For

Country Networks" - Bennett.



Victoria - Telecommunications
Development Plan 1980-1990

Local Networks

Country Switching Networks
Routing Discipline

Figure 5

TELECOM POLE STATISTICS (1952-1982)

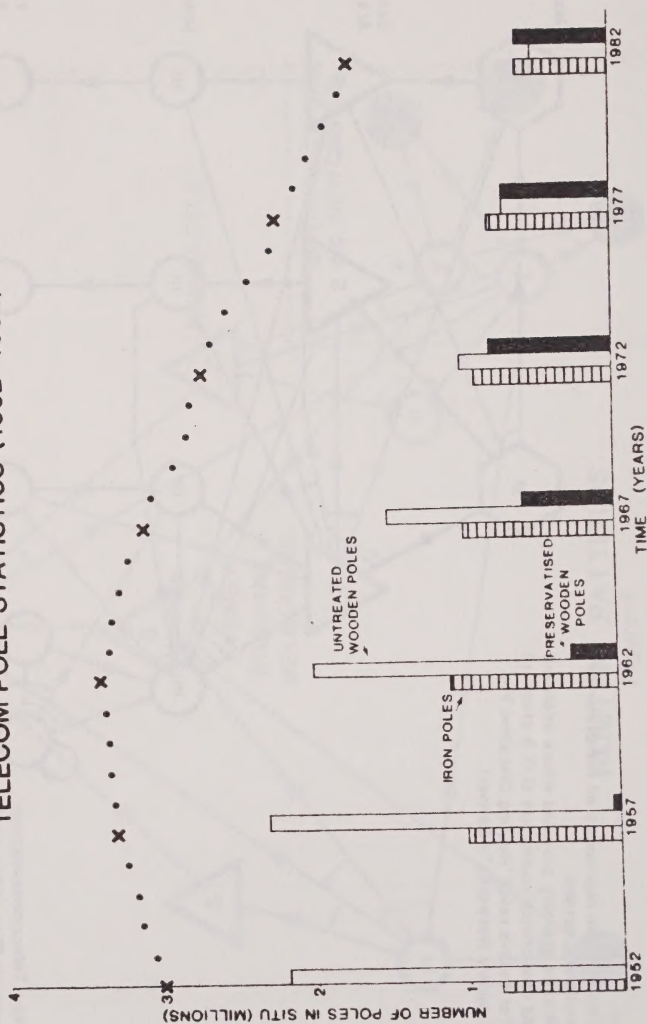
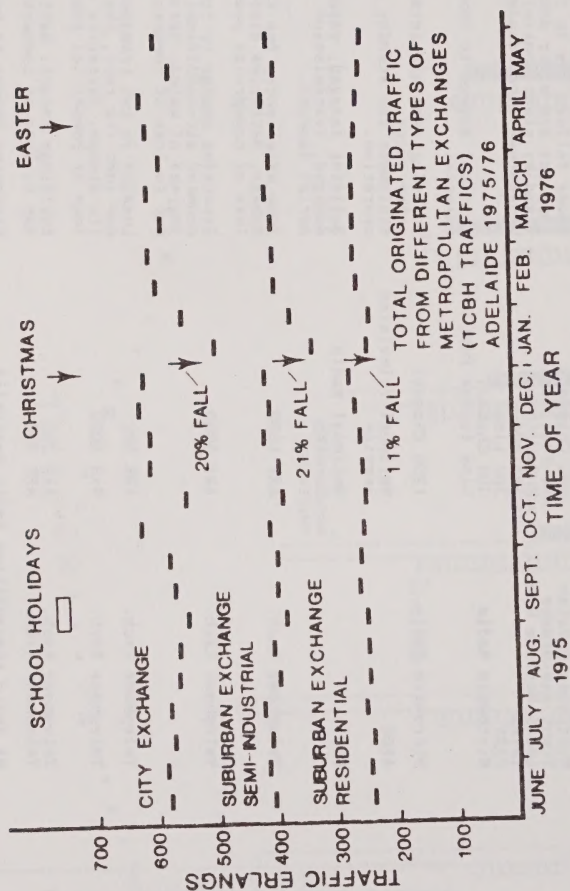


Figure 6

SUMMARY OF DAMAGE

Location	Equipment	Type/Size	Damage Sustained
SMITH STREET	Telephone Exch.	ARF 3000	Loss of iron roof over most of building structure allowing ingress of water. Power failure due to loss of commercial supplies and water damage to stand-by plant control circuitry. Widespread water damage to equipment. Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	Tandem Exch.	SRB 3400	
	Multiplex Carrier	960 Inlets	
	Trunk Assistance	500 Channels	
	Local Service Operators	14 Positions	
BLAKE STREET	Telex	8 Positions	Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	PABX	ARF 400	
	Microwave Radio	300 Line 300 Channel Link to Cox Pen.	
DOUGLAS STREET	Microwave Radio	1200 Channel	Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	ABD6	National Television Service	
BERRIMAH	8DR	National Radio Service	Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	Telephone Exch.	ARF 1600	
NIGHTCLIFF	Telephone Exch.	ARF 5000	Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	Telephone Exch.	ARF 5000	
CASUARINA	Telephone Exch.	ARK 600	Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	Telephone Exch.	SXS 1000	
HOWARD SPRINGS NOONAH	Telephone Exch.	ARK 200 } ARK 200 }	Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	Telephone Exch.	ARK 200 }	
COX PENINSULA	HF Radio transmitting Radio Australia programmes	ARK 200 }	Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	HF Radio transmitting Radio Australia programmes	ARK 200 }	
FIGURE 7	Tropospheric Scatter Radio System Terminal providing link to Nhulunbuy	ARK 200 }	Physical damage to tower-mounted antenna. Building remained intact with minimal water entry. Equipment and standby plant continued operation. Building damaged, water entry, transmitter damaged, transmission lines and aerial damaged. Some water entry due to minor building damage, Batteries discharged due to loss of commercial power. Extensive damage to roofing and roof mounted air-conditioning plant allowed ingress of water. Batteries discharged due to loss of commercial power. Located in two transportable buildings; one lost its roof, the other was blown off its attapus. Batteries discharged due to loss of commercial power. Buildings intact. Batteries discharged due to loss of commercial power. Extensive damage to buildings, loss of serial systems and transmitter damage due to water. Loss of commercial power. System intact and resumed operation when power restored.
	Microwave Radio link to Smith Street	ARK 200 }	



Seasonal variations of telephone traffic over a year from different types of Metropolitan Terminal Exchanges

Figure 8

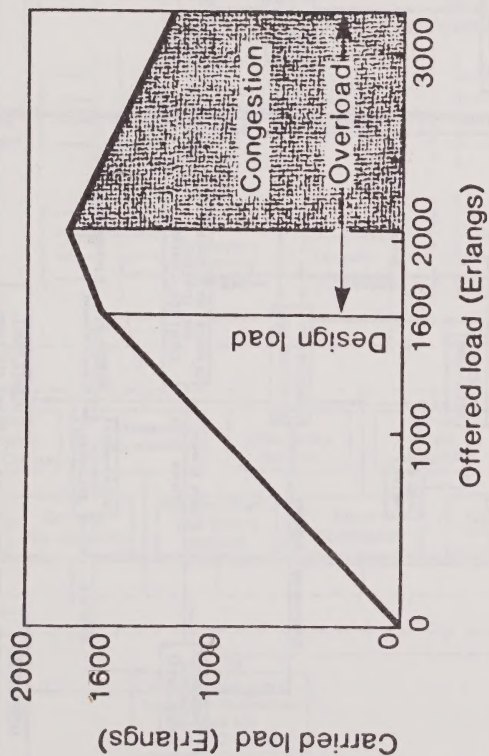
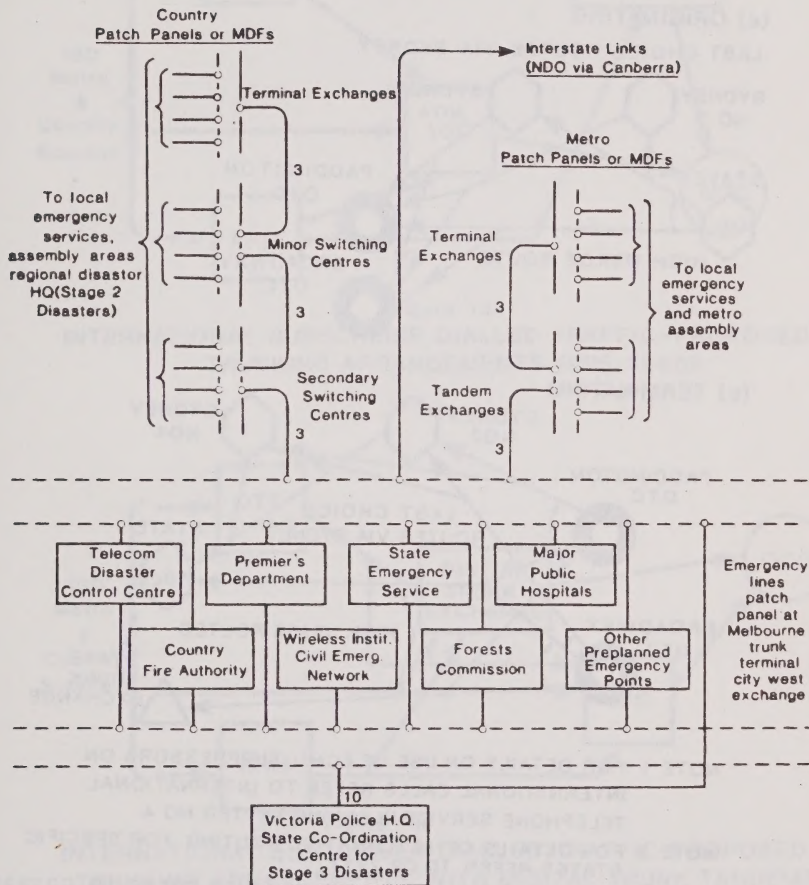


Figure 9

NETWORK PERFORMANCE UNDER OVERLOAD

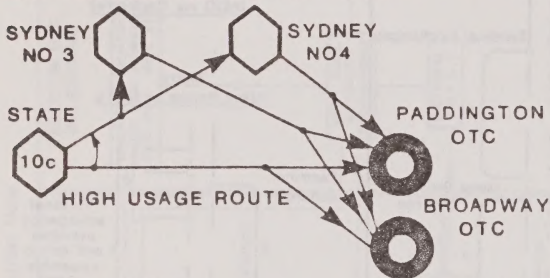


EMERGENCY SERVICES NETWORK-VICTORIA

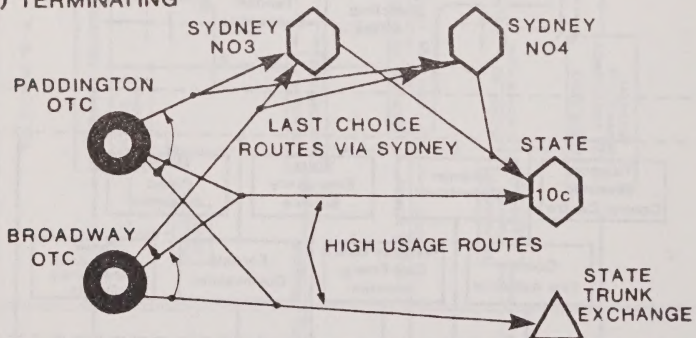
Figure 11

(a) ORIGINATING

LAST CHOICE ROUTES VIA SYDNEY



(b) TERMINATING



NOTE 1 FOR DETAILS ON USE OF ECHO SUPPRESSORS ON INTERNATIONAL CALLS REFER TO INTERNATIONAL TELEPHONE SERVICE PLANNING LETTER NO 4

NOTE 2 FOR DETAILS OF ALTERNATIVE ROUTING FOR SPECIFIC STATES REFER TO CP 2217

NOTE 3 FOR DETAILS OF CIRCUIT QUANTITIES REFER TO CP2222

TYPICAL TRUNKING ARRANGEMENT FOR INTERNATIONAL TRAFFIC

Figure 12

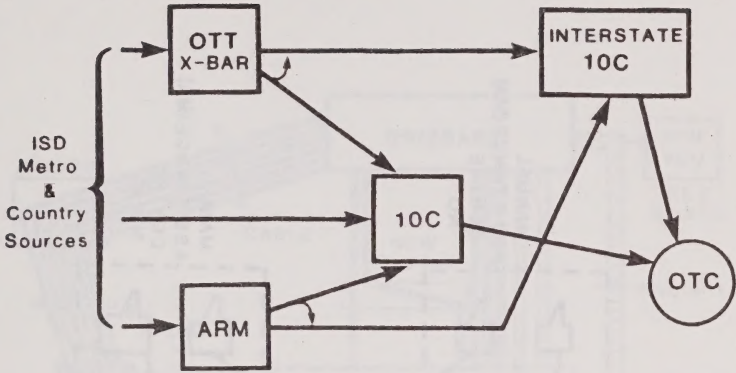


Figure 13a

INTERNATIONAL SUBSCRIBER DIALED TRAFFIC-PROPOSED
TRUNKING ARRANGEMENTS (PRE 1985)

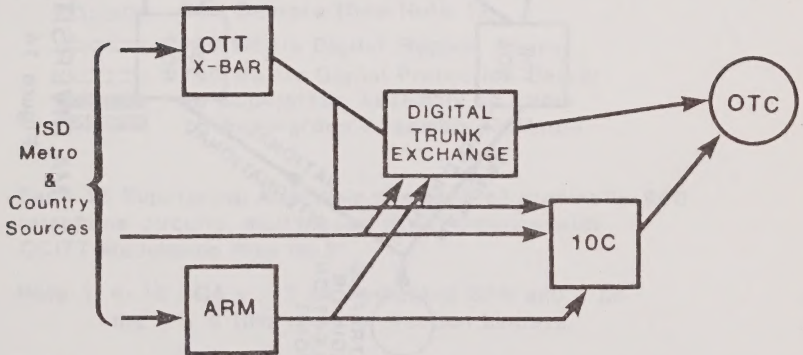
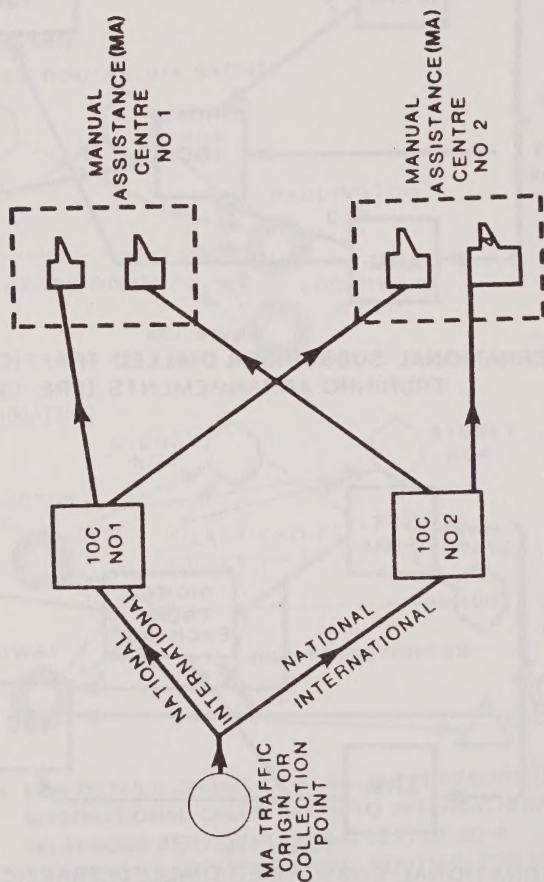
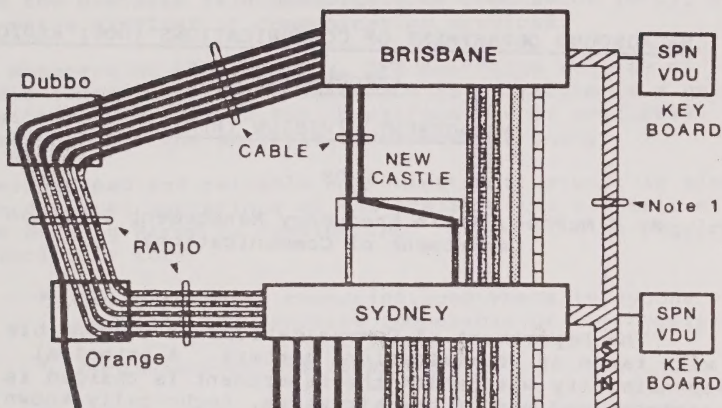


Figure 13b

INTERNATIONAL SUBSCRIBER DIALED TRAFFIC-PROPOSED
TRUNKING ARRANGEMENTS WITH DIGITAL TRUNK TANDEM



MA DIVERSITY
Figure 14



Legend:

	SPN Bearers (See Note 1)
	140 Mbit/s Digital Regular Bearer
	140 Mbit/s Digital Protection Bearer
	15 Supergroup Assembly on Cable
	15 Supergroup Assembly on Radio

Each 15 Supergroup Assembly consists of nominally 900 telephone circuits, multiplexed in accordance with CCITT Modulation Plan No.2

Note 1. 4x15 SGA's : 2 on dedicated SPN and 2 on the 4 & 6 GHz radio protection bearers.

SERVICE PROTECTION NETWORK-PHASE 1 (Network Situation as at 1985)

Figure 15

DISASTER COMMUNICATIONS STUDY
ALTERNATIVE CAPABILITIES WITHIN AUSTRALIA FOR RADIO-
COMMUNICATIONS
IN A DISASTER SITUATION

BACKGROUND DEPARTMENT OF COMMUNICATIONS (DOC) RADIO
FREQUENCY
MANAGEMENT DIVISION (RFM)

by

Mr J McPhee, Radio Frequency Management Division
Department of Communications

The Department of Communications is responsible for a wide range of communications matters. A principal responsibility with which the Department is charged is the management and use of the air-waves, technically known as the radio frequency spectrum. This function is performed by the Department's Radio Frequency Management Division, (RFM). The Division has its Headquarters in Canberra and Melbourne. Regional offices are located in each capital city and there are District offices situated at some major provincial centres.

The objective of radio-frequency management is to enable information to pass through the electromagnetic spectrum between all users in the most efficient and economic manner practicable, with minimum interference between services.

All radiocommunication equipment ranging from simple hand-held equipment through to satellite services is regulated by the RFM Division in relation to frequency assignment and use. Certain major users such as Defence and Aviation exercise a large degree of self regulation within DOC agreed guidelines.

Activities of the Division which are particularly relevant to the current disaster scenario are:

- * assignment of operating frequencies;
- * regulation of radio communication services;
- * investigation of interference to radiocommunication services;
- * issue of licences.

From this outline of the Division's activities, you will appreciate that the Division has a management and co-ordinating role to ensure that the needs of existing and potential spectrum users are satisfied as far as practicable. It is important to note that unlike organisations such as Telecom and the Overseas Telecommunications Commission (OTC), RFM is not a provider of communication services.

As managers of the spectrum, RFM maintains records of all radio-communication licensees and is therefore in a unique position to assist in the identification of available resources for the scenario under current study.

A widespread and reliable communications network is essential for disaster operations of the scale of the scenario which the Working Party is considering. Radio will be required principally for:

- * point-to-point communications where telephone services are rendered inoperable or are overloaded;
- * on-the-scene-communications;
- * mobile communications for reconnaissance;
- * mobile operations including direction of personnel, equipment and vehicles;
- * advice to public both within and without the disaster area;
- and
- * ground to air communications.

There is no single organisation equipped to meet all of these requirements; nor is there a universal solution which can be applied to meet all disaster communication situations. It is necessary to make the best use of available resources.

At this stage, it should be stressed that RFM people are not expert in the disaster business. An attempt has been made to demonstrate ways in which available resources may be pressed into service to supplement the communication needs arising from the scenarios concerned.

Before addressing the three problems directly, it should be made clear that RFM has deliberately avoided anything except the barest mention of existing facilities which are known and utilised already by emergency organisations. Defence, Telecom, OTC and others will be mentioning their own communication facilities. Accordingly, an attempt has been made to identify alternative Communication resources which are controlled by Department of Communication.

South Australia

Adelaide is probably the worst case, as a sudden earthquake of this magnitude would almost completely disrupt normal communications and cause widespread panic.

Victoria

Bushfires occur in Victoria every summer. For this reason, unlike the sudden earthquake situation in South Australia, there is always a degree of preparedness. However, the unpredictable nature of a bushfire can often severely tax emergency communications.

Queensland

North Queensland Coastal Centres expect cyclones every year. Cairns is very isolated, and its major telecommunications systems are vulnerable to a storm surge of this magnitude. Because of its isolation greater use is made of longer range high frequency communications equipment in both marine and land services. The existence of this equipment increases the options available for emergency communications and provides a source of reasonably competent radio operators.

ADELAIDE -DISASTER SCENARIO

It is assumed that the city has suffered major earthquakes along the Para, Burnside, Beaumont and Eden fault lines with intensities of 9 (on the modified Mercalli scale) recorded at the junction of the Para fault and the River Torrens and the junction of the Beaumont and Eden faults. With the centre assessed as the junction of Fullarton and Greenhill Roads, the damage radius extends to a 20 km radius from the city centre, with intensities of 6 on the modified Mercalli scale recorded at that distance. Severe damage has occurred to electrical installations, resulting in total disruption of all fixed and mobile communications within the area.

COMMUNICATION PRIORITIES

It is assumed that no official communications capability of any kind is available in the devastated area. Provision of basic communications facilities by utilizing alternative communications resources is therefore necessary, both during the initial phases of rescue and relief operations. These facilities are required to provide communications within the disaster area and from that area to the National Disaster Organisation (NDO) Headquarters in Canberra. The priorities

associated with provision of communications would broadly encompass:

- * initial notification to the NDO;
- * establishment of basic communications from the immediate area to facilitate first-in rescue and relief organisations;
- * provision of a link to the nearest functioning broadcasting facility to enable information to be broadcast to the general public concerning the disaster;
- * augmentation, within 24 hours of basic facilities with additional equipment drawn from other areas; and
- * establishment of intrastate and interstate communication networks.

INITIAL NOTIFICATION TO NDO

Available resources that could be used for this purpose include:

- * HF radio installations fitted to fishing, pleasure craft or large sea going vessels. A number of merchant ships would be located at Port Stanvic, Port Adelaide or Outer Harbor and many fishing vessels and pleasure craft fitted with maritime mobile equipment could be utilized. These may be located at marinas, or on trailers at private premises. This shipboard equipment would, in each case provide access to the Australia wide network of OTC coast radio stations via the marine distress and emergency frequencies 2182, 4125 & 6215.5 KHz. Access to the switched telephone network and telex facilities could also be available depending on the type of shipboard installation fitted. All large ships, many small craft and yacht clubs have equipment capable of operating on the VHF international distress, safety and calling frequency 156.80MHz (Ch16). This facility could be used to either contact the local OTC coast station at McLaren Vale or another vessel capable of relaying messages over longer distances. Some large vessels are fitted with maritime satellite communication equipment which could provide automatic access to the international telecommunication network.
- * Surviving land based fixed or mobile installations provide additional alternative. Most high frequency channels used by private companies are shared with other services. Messages could be transmitted by this mode and relayed to the NDO Headquarters in Canberra. Similarly, many private HF mobile installations are fitted with Royal

Flying Doctor Service (RFDS) frequencies and messages could be passed in this manner.

- * The amateur service is a versatile alternative as it provides access to frequency agile equipment and a degree of expertise to establish temporary communication installations;
- * Citizens Band Radio Service (CBRS) stations which could relay a message to be passed on to NDO Headquarters via the public telecommunications network.

ESTABLISHMENT OF BASIC COMMUNICATIONS FROM IMMEDIATE AREA

Mobile equipment could be brought into the area in order to quickly establish limited communications. Due to the magnitude of the disaster these facilities would need to be supplemented by other resources. Additional facilities could be provided by using equipment from local private land mobile radiotelephone services (LMRTS), such as taxi services, delivery firms, security companies etc. The use of such facilities may be limited however due to several factors, which include:

- * the majority of UHF LMRTS services employ two frequency operation, therefore most mobile and portable equipment would be rendered useless without a base station (ie a mobile cannot be used as a base to talk to other mobiles nor can mobile stations intercommunicate);
- * an increasing number of private services, either to overcome interference or because of channel sharing, employ tone access facilities which are designed to prevent unwanted transmissions being heard (ie private line etc). Consequently, in some circumstances only mobile and portable equipment from the same network is compatible.

Accordingly, it is considered that supplementary communications facilities should be drawn from VHF low or high band services employing single frequency operation. Within the Adelaide area there are services of this nature from which a temporary communications system could be formed. Where large numbers of transceivers are required, it is necessary to avoid frequency incompatibility problems. In such cases it is preferable to draw on the resources of large users. Where the formation of an adequate network on common frequencies cannot be achieved, an alternative system can be established using a number of frequencies. The difficulties of intercommunicating with such a diversity of frequencies can only be overcome by having each frequency available at a central control point.

An emergency communications system could be built up using the equipment from a major service as the backbone, with other equipment being used for minor sub-groups. To ensure minimal interference, equipment from differing frequency bands should be utilized at combined sites. Liaison between relief organizations could be provided by using VHF amateur equipment and CBRS transceivers.

To provide contact with the NDO headquarters a viable method would be to request a large vessel (ie tanker cargo, passenger ship etc) to stand off Adelaide. A VHF link using available maritime equipment from vessels or yacht clubs could then be installed, thereby establishing a self powered fixed HF communications link. Other links for outside broadcasting, or fixed point to point communications could be established as required by using available HF, VHF or UHF equipment from land mobile networks or with the aid of amateur equipment.

AUGMENTATION OF BASIC FACILITIES

Within 24 hours the basic communication facilities provided for the disaster area would be augmented from the state wide network of emergency services ie Country Fire Service (CFS) Ambulance, State Emergency Services (SES) etc. Other South Australian sources of equipment could be companies such as Santos Pty. Ltd., John Holland Construction and the South Australian Pipe Line Authority. These services maintain large networks in South Australia many of which could conceivably be relocated at short notice (in temporary installations at construction sites etc).

Similarly, interstate sources of communications equipment that could be utilized would be large companies, such as Hammersley Iron and BHP, or synthesized equipment stocks held by distributors and manufacturers. Government resources that could be called in to assist would encompass equipment from the Tasmanian State Disaster plan, and domestic resources maintained by Commonwealth Departments and State Government Bodies.

Provision of communication links from the disaster area to interstate for use by the general public, would in all probability, be provided by portable telecom link equipment into the broadband link system. Additionally, the Amateur Wireless Institute Civil Emergency Network (WICEN) would be called upon to provide assistance.

ASSOCIATED COMMUNICATIONS CONSIDERATIONS

Options are:

- * CBRS Equipment would be readily available from shops

and stores within the disaster area. This type of equipment could be used where difficulty in obtaining other equipment exists.

- * The provision of power supply backup in the form of batteries and portable generators is necessary to ensure continuity of service. This need was highlighted in the recent South Australian bush fires where the lack of such provisions was a major problem.

CAIRNS - DISASTER SCENARIO

The city and associated beach areas have suffered a severe cyclonic impact and a resultant 5 metre storm tide. For all practical purposes, fixed and mobile communications facilities within the maximum storm tide contour must be assumed to be inoperable.

LIKELY EFFECTS ON COMMUNICATIONS

The inoperable facilities at Cairns as a result of either winds or storm surge would probably include the main telephone exchange, microwave telephone link, airport, including air traffic control, Naval base radio facilities, one, and possibly both, broadcast stations, all programme lines, Police, SES, Ambulance and many commercial two way base stations.

In these circumstances, best use must be made of all remaining communication facilities, as very little of the basic emergency network survives.

RFDS

The Royal Flying Doctor Service Base at Cairns is engineered to survive cyclonic winds, and should be continuously available as it is above the predicted storm surge level. From this station contact could be made with outpost stations, which in turn would raise the alarm.

Following this initial alert, the station could be used to communicate with other RFDS suitably fitted stations which have access to the public communication network.

SMALL SHIPS

Some radio equipment installed in fishing boats, and many of the hundreds of trailer mounted pleasure craft which are fitted with common HF, VHF and 27 MHz frequencies would survive. These could be used to communicate with each other, and limited coast stations at Babinda and Innisfail. Some vessels would also be able to communicate with Townsville Radio (VIT), which is the nearest OTC coast Radio Station. Other coast stations could also be contacted via this means.

LARGE SHIPS

Cairns is on a main shipping route inside the Barrier Reef. Although many of the larger ships could not get into Cairns harbour, a suitable vessel might be able to berth, or be linked ashore using international VHF maritime mobile equipment and HF equipment to contact an OTC coast radio station. Additionally, vessels may be fitted with maritime satellite radiocommunications equipment which could provide automatic access to worldwide telecommunication facilities.

AMATEURS

North Queensland has relatively few amateur radio operators. However, amateurs are generally very well organised and are a most valuable resource.

Cairns has an active WICEN group, who are able to communicate through repeater station at Mt Bellenden Ker, south of Cairns, which is housed in a television transmitter building. This repeater station is also accessible to amateurs over a large area of North Queensland, including Townsville. It has an assured power supply, which would be most useful in this emergency situation.

OTHER BELLENDEN KER SERVICES

Also sited at Mt Bellenden Ker are repeaters used by DOC, and Main Roads Department which could be activated as links between Cairns and Townsville in an emergency situation.

The Queensland Electricity-Generating Board operates a repeater at Mt Sheridan. This can be connected to other centres over a power line carrier system using very high voltage transmission lines. These lines have proven to be largely immune from cyclone damage, so this link might reasonably be expected to survive.

The link could be utilised for general traffic in the first stage of the disaster, before it became fully occupied with high priority traffic relating to restoration of electricity.

LOCAL COMMUNICATIONS WITHIN CAIRNS

Apart from taxi services, there is no extensive single private VHF or UHF land mobile radio service network in Cairns. There are a number of channels shared by 25 or so mobiles, which would be utilized after the cyclone for local communications. These commercial services could be particularly valuable as links between relief centres and the main control centre, and in other Disaster Welfare activities.

LONG DISTANCE COMMERCIAL HF

There are a number of high frequency land mobile radio services, both base and mobile in and around Cairns. As available channels in the high frequency spectrum are normally shared by commercial services, at least one of them would be able to raise the alarm by contacting another base or mobile station. This facility could be used thereafter for other traffic as required.

BROADCAST LINKS

It is unlikely that Broadcast Station program links in Cairns would survive the storm surge. It is expected however that at least one of the transmitters would remain intact. This transmitter would need to be provided with a temporary program link in order that information relating to the disaster may be disseminated through the station.

This could be provided quite simply by using equipment from a commercial land mobile service in the VHF or UHF bands.

If neither of the transmitters survived, it would be necessary to establish a link to one of the Atherton Tablelands transmitters, which could be done in a similar manner, perhaps requiring 3 relays or a combination of temporary radio and landline.

AIRCRAFT

Department of Aviation have 4 or 5 mobiles fitted with air ground frequencies which are able to talk to any civil aircraft in the area. At least one of these would be available to provide emergency air traffic control, or any other emergency ground/air communications, to non-military aircraft.

CBRS

Operators in the Citizens Band Radio Service would no doubt, contribute their resources in providing vital communications wherever and whenever possible.

VICTORIA - DISASTER SCENARIO

Though no doubt equal in magnitude to the previous disaster situations described, bushfires in States such as Victoria, present by their nature numerous additional difficulties which are not necessarily present in an earthquake or cyclone type situation.

The disaster as envisaged is a large number of separate fires, both major and minor, on a wide front over some 60% of the State. Victoria, as with other Australian states so threatened, is fortunate in having various organizations geared to meet these almost annual occurrences.

Major bushfires, however, pose extreme difficulties in maintaining existing forms of communication and in providing effective supplementary communication systems in those areas affected at those times when they are most required.

This was particularly demonstrated during the recent disasters of this nature in Victoria, when the abnormally high number of telephone calls, both to and from the areas concerned, resulted in severe congestion of the telephone network. This type of situation, of necessity, places very heavy demands on those auxiliary forms of communication which may have been unaffected or so far have survived the disaster. Such a situation results in the breakdown of fixed communications between Melbourne and the affected areas.

For the purpose of this exercise four small townships have been evacuated as being under immediate threat of destruction, one larger centre is severely threatened and up to eight fires are burning in scrub or pasture land which pose a serious threat to a number of widely dispersed farmlets and properties. A number of these fires have already been burning for some one or more days leaving a path of destruction in their wake. It will be appreciated from the above that we have a scenario where not only have established communication modes already been seriously disrupted, but it is likely that additional systems will also be affected. The problem in this situation is that simultaneous endeavours must be made to provide satisfactory alternative communications to those areas already devastated and those under immediate threat. Contingency plans must also be drawn up for those areas which may be in a similar situation within 48 hours.

It is not proposed in this exercise to discuss the communications systems employed by those organizations engaged in on-the-scene fire fighting activities. These systems have been refined over a long period of time and enjoy such advantages as the ability to readily inter-communicate at the on site control level.

In order to overcome the extreme difficulties posed by the congestion previously described to the telephone network, it is essential that supplementary communications be provided.

As part of this exercise, it was determined that the most effective manner in which such communications could be provided would be by utilizing where appropriate some of the many repeater stations which are strategically located throughout the State.

In attempting to assess the effectiveness of a communications network based on such a system, it was established that at present, no comprehensive list exists of those repeater stations which is sufficiently descriptive as to indicate whether such stations are equipped with stand-by mains power facilities. As this information would be essential at short notice in such a scenario, when attempting to establish alternative communications, the compilation of such a list is a matter that very much needs to be addressed.

All national television transmitter sites in Victoria employ a private communications system which has a direct link to a control centre located at Surrey Hills. This system could be utilized at very short notice to provide for essential communications to Melbourne from the disaster area nearest to the appropriate television transmitting station and from Surrey Hills to the area concerned. Such installations are normally manned 16 hours per day, enjoy self-sufficient mains power and are located in areas which have been rendered as fire proof as possible.

The State Electricity Commission employs a very extensive low capacity private communications link system, within the State. No doubt, in moments of dire extremity this system could also be employed. In view of the responsibilities of this authority however, it is considered that it would be utilizing its network to the fullest in attempting to cope with the effects of the disaster on those areas of its responsibilities.

It will be apparent from the foregoing that voluntary services, such as are provided by WICEN, would be of great assistance in this situation. WICEN is an amateur service emergency network which has been established under the

auspices of the Wireless Institute of Australia to provide emergency communications assistance wherever and whenever this is required. The organization is geared for an immediate response to any request made of it from those authorities responsible for disaster co-ordination.

In such a scenario, WICEN in the past has proven capable of very quickly organizing an emergency communications link between a strategically located control centre near Melbourne and a site as near as is practicable to the seat of the disaster area. This system, though most effective could not be expected to adequately cater for the large demands that would be expected of it.

DEPARTMENT OF COMMUNICATIONSRADIO FREQUENCY MANAGEMENT DIVISIONEMERGENCY COMMUNICATIONS SYSTEM MODULESYSTEM DESCRIPTION

The Emergency Communications System is a combination of modules with communication equipment to enable temporary communications to be established during emergencies or when normal communication facilities are inoperative or cannot be provided rapidly. The basic communication services provided are as follows :

- a. HF long distance link used to establish communications while the communications system is being established;
- b. Radio Repeaters for communication to mobiles or portables operating in the vicinity of the communications module;
- c. A number of automatic telephone handsets connected by a temporary line to the communications module to a small PABX to provide telephone facilities;
- d. Teleprinters for connection to the telex network;
- e. Combinations of the radio link, telephone and telex stations which are connected to the communications module by narrow band, VHF or UHF links;
- f. A low capacity broad band microwave link, to provide connection between the communications module and the telecommunications network;
- g. A termination module with multiplex equipment to provide modulation and demodulation of the broad band signal, prior to connection to the telecommunications network;
- h. In addition a number of repeater modules can be used to link the communications module via a number of hops to the nearest available established communications circuit. The essential component is the communications module which is located at the centre of the area of activity which contains the majority of the communication facilities. The communications module is essentially a small light weight container which provides housing and mechanical support, as well as insulation for the HF long distance SSB

transceivers, the VHF or UHF mobile talk through repeater systems, the small PABX, the narrow band radio links and the microwave low capacity bearer system. In addition the communications module contains a separate generator and battery bank to provide primary power for the module. It is dimensioned so that it can be air lifted into an appropriate location.

With the exception of the HF link the communication components in the communications module are essentially point to point systems and so logically the communications module should be located at an elevated site in the area of activity, so as to provide the best range for both the mobile radio repeater system and the microwave link system necessary to establish communications into the principal telecommunication network.

The system termination module essentially provides housing for multiplex equipment so that it can be located at the nearest exchange and connections made between the termination module and the necessary communications circuits.

In general the communications module can be configured to provide a number of communications arrangements. Depending upon the application the following description details a particular version, however obviously the number of circuits and facilities can be varied as required.

DETAILED DESCRIPTION

Field Services

The basic services provided by a module include HF field, mobile fleet, telephone circuits line connected, line connected teleprinters and radio connected phones plus telex.

In general two HF field circuits are provided. HF 50 watt transceivers are located in the communications module and connected by a temporary line to 2 HF field remote control units. These control units enable the establishment of an operations point at some distance from the communications module. The HF circuits are provided so that rapid communications can be established as soon as the communications module is located at site, before remainder of the communications circuits are brought into operation, and provide the initial urgent or critical communications link with major disaster centres or the Natural Disasters Organisation. Normally the communications module includes 2 mobile talkthrough repeaters. These enable two independent fleets to be operated to make differing operational requirements.

Since talkthrough repeaters are used, control of the mobile repeaters located in the communications module can be

achieved from desk-mounted radio equipment. Similarly, the two talkthrough repeaters provide facilities for portable operations within the coverage area of the module. The range of this service is basically point to point and is determined by the height of the communications module above the surrounding terrain.

The communications module provides a main distribution frame onto which typically 15 automatic telephones can be connected via temporary lines. These telephones have access to the public switched network via the PABX and the low capacity bearer system. The small PABX provides line switching and allows intercommunication in the area between phones as well as providing switching which guarantees redundancy should any of the communication links fail. Similarly an MDF is provided for connection of typically 4 telex machines enabling the transmission of accurate recorded data particularly in the case where names and details of personnel movement are required.

Further telephone and telex services in the field are provided by a radio-linked connection to the communication module. This allows further operational sites to be established which can be equipped with both phones and teleprinter without the need to lay temporary lines. Again, these sites can be located within line of sight coverage of the communications module. Because of the ever increasing importance of data communication circuits provision is included for two (2) only 1200 baud modems which will enable the connection of VDUs to the service which may be essential if computer facilities are included at the principal operation centre or disaster relief centre.

Communications Module

HF communications are provided by two 50 watt single side band transceivers. Audio control of these transceivers is obtained from the two HF field remote control units.

Two wire circuits are provided and generally control can be provided up to several kilometres from the communications module. The mobile services are provided by two VHF or UHF talk through repeaters. Control of these repeaters is obtained from field located radio equipment. These two repeaters however are connected into the bearer system so that control can be provided directly from the central operations via the Telecom network through the communications module to the mobile fleet thus local or operations centre control of the mobile repeater stations is obtained. The bearer system comprises a 1.5GHz broad band microwave link, together with a 12 channel multiplex system. Two channels are used to provide control of the VHF repeaters already mentioned, seven channels are used to provide trunk circuits to the communications module 20 line PABX, two channels are connected to 1200 baud modems for the optional use of data

terminals and the remaining channels are used in conjunction with the telex adaptor to provide telex circuits. The 20 line PABX provides termination for both the line connected automatic telephones and the radio connected telephones. The PABX is a stored program device which allows a wide variety of facilities such as: Callback, Call Transfer, Camp on etc. to be provided and are considered essential in emergency situations. The two radio links which provide radio connection to two remote telephone and telex systems are provided by VHF or UHF single channel subscriber system which is fitted with a speech plus duplex terminal to provide telex and automatic telephone facilities. The majority of the equipment within the communications module is powered from 12 volts negative earth or from 50 volts via a DC/DC converter.

Field Service Equipment Housing. The module is organised so that field equipment which includes the two HF field remote control units, the mobile radio operated control units for the VHF repeaters, the telex machine, telephone handsets and the terminal equipment for the radio linked telephone and telex services so that the equipment can be safely transported to the remote site.

Antenna Systems. The communication module includes an integral pump-up tower plus an adjacent or portable tower. The integral pump-up tower provides mounting for the talk-through repeater antenna, the narrow-band telex and telephone radio linked antennas as well as the 1.5 GHz dish. The separate free-standing mast provides support for the HF dipole which is installed between the integral tower and the portable tower.

Communication Module Range. With reasonable attention to siting, the communications module can be located some 80 km from the nearest available communication circuits. For those instances where the communication circuits are not available within 80 km, non-demodulating repeater modules can be installed to provide the necessary links and distance. Repeater modules are essentially a non-demodulating back to back 1.5 GHz repeater and can be supplied with solar power panels for primary generation.

Package Dimensions.

Depending upon equipment insulation, the communication module is normally 2 metres wide by 2 metres deep by 2 metres high. Repeater modules are generally 1 metre by 1 metre by 1 metre as is the terminal module.

Frequency Plan.

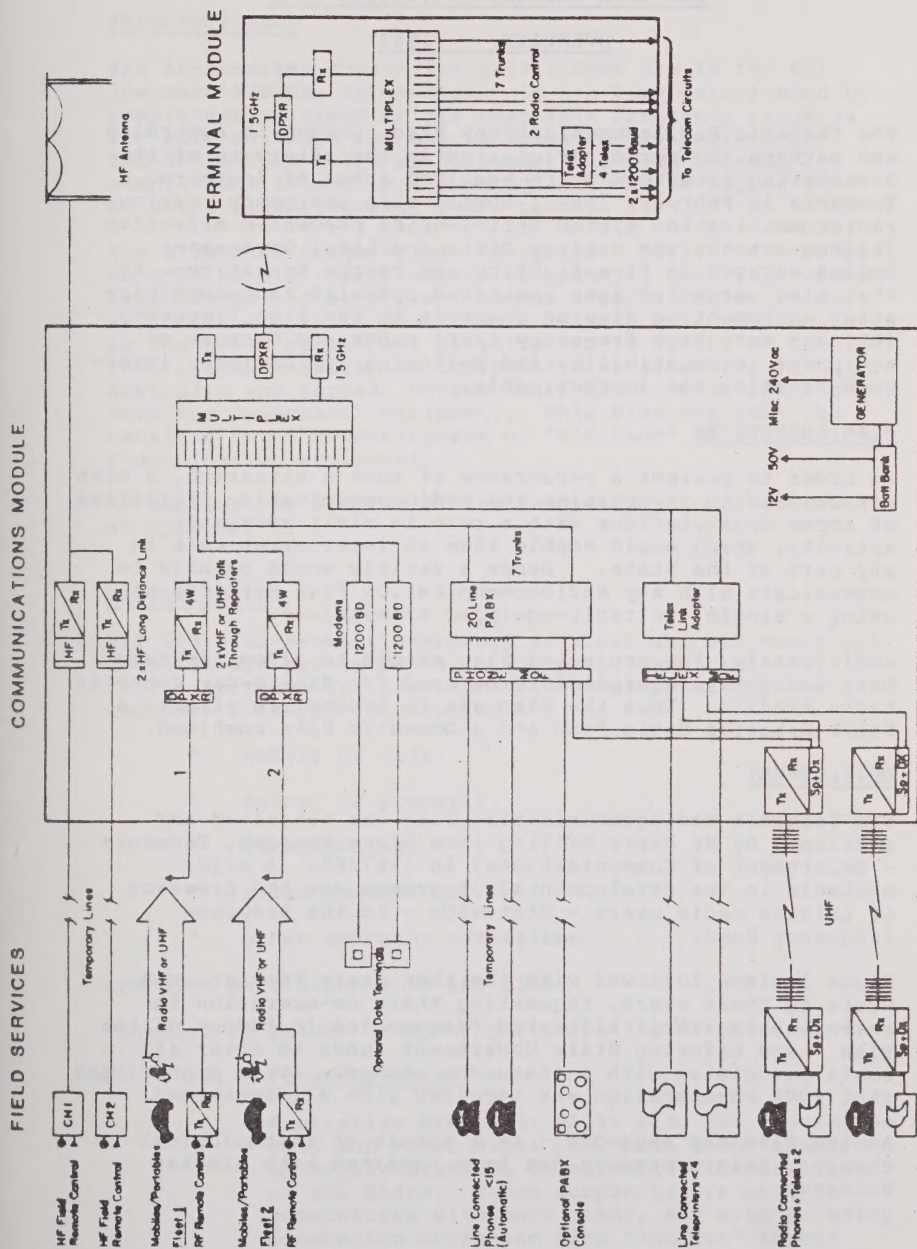
In general, most of the equipment provided for use in the communications module should utilise frequency synthesizers for the channelling of both transmitters and receivers. This allows the communication module to be programmed to meet predetermined frequency plans to ensure its integration

with either existing communication services within the area or with other communication facilities which may be needed to be operated simultaneously.

Summary.

The communications module system provides an effective means of establishing a wide range of communication facilities, including HF, long distance, mobile and portable services, automatic telephone facilities, access to the telex network and single channel radio link for telephone and telex services in a relatively short period of time.

EMERGENCY COMMUNICATIONS SYSTEM MODULE (E.C.S.M.)



TASMANIA RADIOCOMMUNICATION PLAN

OVERVIEW - 1983

The Tasmania Radiocommunications Plan, unique in Australia and perhaps the world, originated in the aftermath of the devastating firestorm which engulfed areas of Southern Tasmania in February 1967. During this emergency, serious radiocommunication system deficiencies prevented effective liaison between the various State and Local Government bodies engaged in fire-fighting and rescue operations. At that time, organisations concerned operated radiocommunication equipment on diverse channels in the high frequency (HF) and very high frequency (VHF) bands and because of equipment incompatibility and switching limitations, intercommunication was impracticable.

PLAN OBJECTIVES

In order to prevent a recurrence of such a situation, a plan was devised to re-organise the radiocommunication facilities of those organisations with a role in civil emergency activity, which would enable them to intercommunicate in any part of the State. Hence a vehicle would be able to communicate with any Radiocommunication Plan participant, using a single, suitably-equipped transceiver.

Additionally, the projected plan needed to allow the same base and mobile equipment to be used for day-to-day domestic radio traffic. Thus the Plan was to become, in effect, a State Disaster Radio Plan and a Domestic Plan combined.

DEVELOPMENT

The Tasmania Radiocommunication Plan was conceived and developed by Mr Harry Melling (now State Manager, Tasmania - Department of Communications) in 1967/68. A major obstacle in the developmental programme was the presence of private radio users - Statewide - in the proposed frequency band.

Close liaison followed with the then State Premier, who wrote to those users, requesting their co-operation in relinquishing their allocated frequencies in favour of the Plan - and offering State Government funds to cover all costs associated with a frequency change. It is significant that 100% co-operation was received from all concerned.

As the Plan has expanded - as a result of technological changes, this procedure has been repeated with similar success.

FREQUENCY BAND

The frequencies chosen for this scheme are in the VHF low band (970 MHz to 85 MHz). It has been established by comprehensive field trials that this frequency range is far more suitable for use in Tasmania, (described in THE AUSTRALIAN PILOT as "probably the most thoroughly mountainous island in the world"), than the higher VHF or ultra high frequency (UHF) bands.

The allocated frequencies (46 active - 1983) are arranged so that no difficulty occurs in spanning them in a modern transceiver and at present extend from 76 MHz to 79 MHz approximately, with provision to expand this when necessary, as the state of the art permits. It is worthy of note that radiocommunication equipment manufacturers, in Australia and abroad, became aware of the Plan and the need for "wideband" equipment. This Plan was thus the catalyst for the development of "wideband" 70 MHz radio-communication equipment.

An explanatory diagram of the frequency plan is attached at Appendix 1.

PARTICIPATION

All State Government emergency services and all Municipal Councils are participants in the plan. Additionally, Public Instrumentalities, private companies and farmers who have a responsibility for:

- * safety of life,
- * safety of property,
- * firefighting,
- * flood control or
- * other emergent situations

are also participants in the plan.

Examples of private company participation are as follows:

(a) Forestry Areas

Australian Newsprint Mills Ltd. and Australian Pulp and Paper Mills Ltd. have large numbers of mobile stations in extensive forest areas of the State. These companies are able to communicate with each other, and with Forestry Commission units and fire "lookout" towers

if necessary, as well as with all the emergency services and Municipal Councils.

(b) Industrial Zones

At Bell Bay in Northern Tasmania, a group known as the "Bell Bay Mutual Aid Group" has been formed. This group consists of B.P. Aust Ltd., Mobile Oil Aust Ltd., Comalco Aluminium Ltd., Temco Metals, The Launceston Gas Company and Brambles Holdings (a major freighting company) - all of whom are concerned with safeguarding the port and environs of Bell Bay. Each company is able to communicate with any of the others, and also with the emergency services and the George Town Council, in whose municipality Bell Bay is situated.

(c) Rural Areas

There is also a place in the plan for some isolated farmers, who have proven to be very important during fire management operations.

Co-ordination between these diverse groups is possible because all participants in the plan carry the State-wide liaison frequency, 76.79 MHz.

ORGANISATION

The Radiocommunication Plan, together with good radio training and discipline, avoids the congestion and lack of liaison between organisations which has bedevilled many emergency situations in the past. It is necessary in such circumstances for an overall network controller to co-ordinate communications. The Tasmania Police, the State Fire Commission and the State Emergency Service, each possess mobile command - and - control stations which are suitably deployed and are able to communicate with all units "on-scene". The co-ordinator may belong to whichever organisation has prime responsibility in the particular situation and he has at his command some 46 operational channels to combat an emergency. An important feature of the plan is its ability to employ domestic frequencies for routine domestic or other traffic and matters of mutual concern to municipalities with common boundaries, while the liaison frequency is kept exclusively for high-priority emergency traffic.

These VHF channels are supplemented by 'on-scene' communications, using low-power handheld equipment in the UHF band, further easing the load on the liaison channel. Longer distance communications are obtained by employing H.F. radio or existing Telecom facilities.

LIAISON

Effective liaison between the Tasmania Radiocommunication

Plan participants is established and maintained within the State Disaster Radiocommunication Committee. The State Manager is the Department of Communications representative on that committee.

SUMMARY

This then, is the Tasmania Radiocommunication Plan - an efficient, flexible, multiple-access communications arrangement, having as participants a wide range of public and business organisations.

It optimises the use of existing radio equipment, both for normal traffic and in the event of emergent situations. This ensures maximum equipment serviceability at all times. The Plan greatly enhances the ability of the State of Tasmania to cope with a wide range of crisis situations. It also allows a standard stock of compatible back-up equipment to be kept centrally and then used by a participant should the need arise.

The number of participating bodies in various categories are as follows:

STATE INSTRUMENTALITIES	-	10
MUNICIPAL COUNCILS/COMMISSIONS	-	48
PRIVATE COMPANIES	-	13
TOTAL		<u>71</u>

RADIOCOMMUNICATION STATIONS OPERATING WITHIN THE PLAN

VHF

BASES	-	242 (See Appendix 2)
MOBILES	-	2500
PORTABLES	-	450

HF

BASES	-	20
MOBILES AND PORTABLES	-	50

NUMBER OF PLAN FREQUENCIES AVAILABLE

46	ACTIVE	
80	RESERVE	(Available as site and other circumstances permit)

OPERATIONAL SIMPLICITY

In practice the Plan is designed for ease of use. Each specific active frequency is designated by a code.

Example: State Liaison Frequency (76.79 MHz) = 2

The use of the specific radio frequencies, in megahertz, has been avoided to simplify channel coding designations and to prevent unauthorised access to radio frequency channel information.

Each Plan user affixes an appropriate "Channel Coding" label to his transceivers.

(Example: Appendix 3)

A code index adhesive label showing all plan participants is issued to users for reference. The labels can be mounted as convenient near the radio installation, or carried on the person.

FUTURE PLANNING

The Department of Communications in Tasmania maintains close scrutiny of all technical aspects of the plan. Sophisticated radio-frequency filtering and other precautions are often required to protect the multitude of users. Forward planning by the Department is an on-going activity.

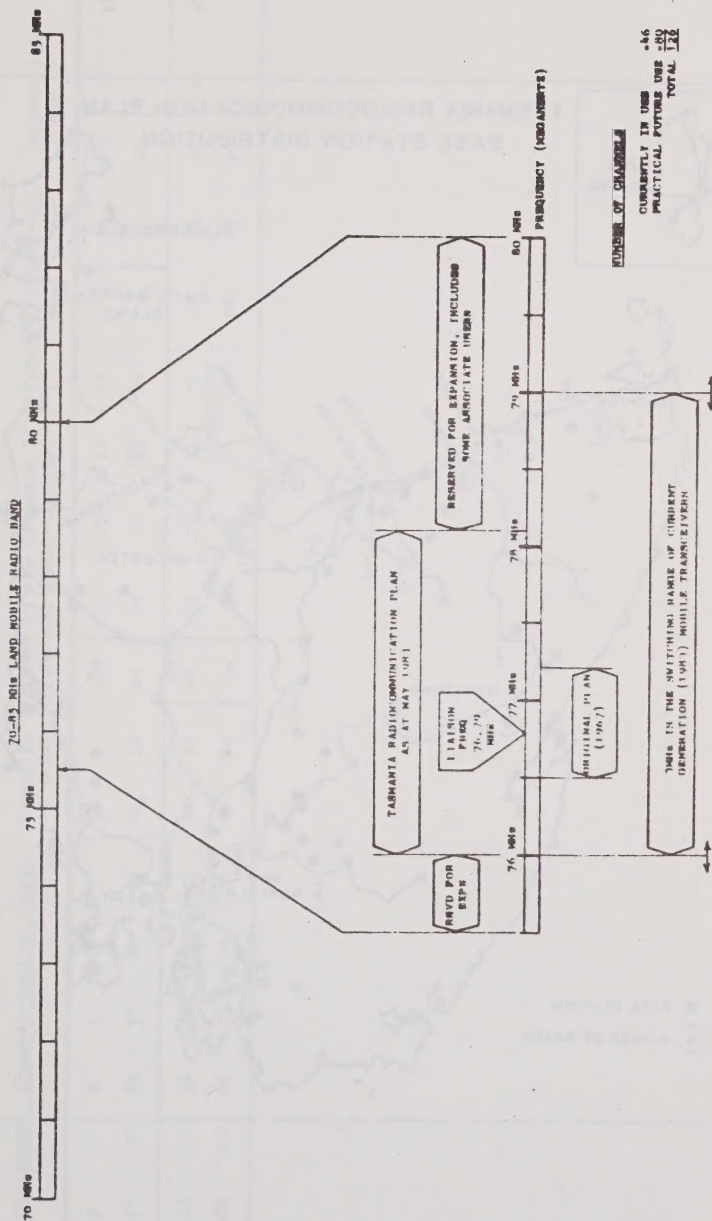
CONCLUSION

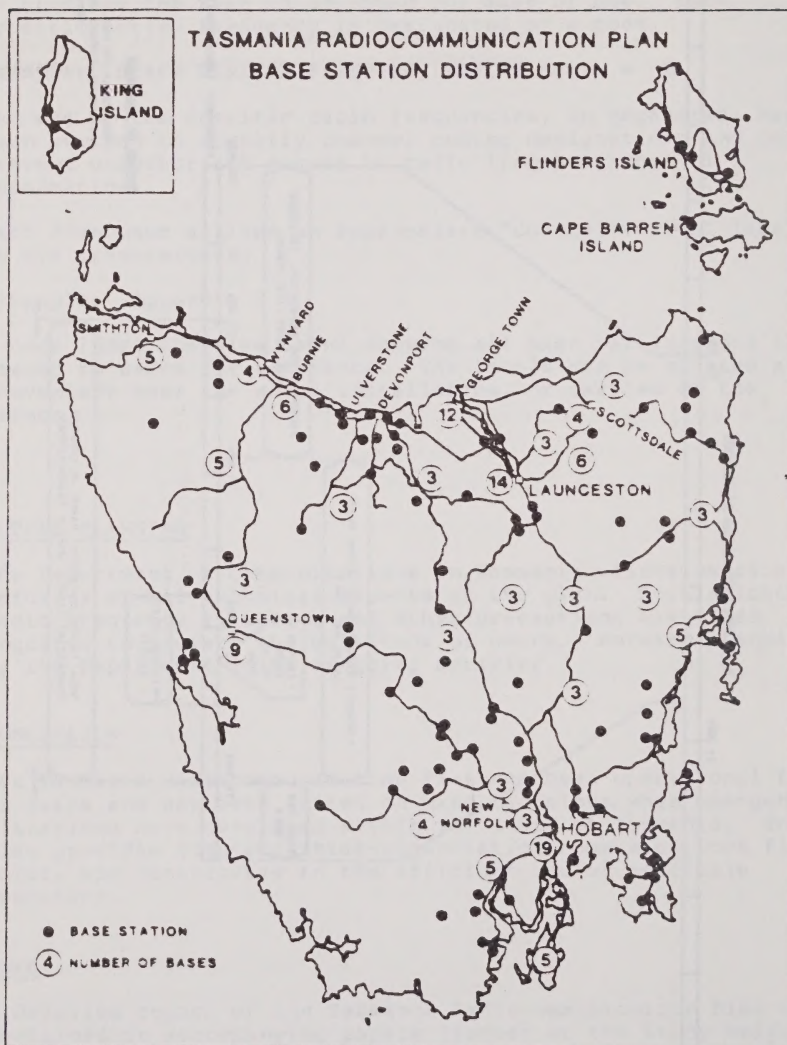
The Tasmania Radiocommunication Plan has been operational for 15 years and has been tested on many occasions when emergent situations have developed within the State of Tasmania. The plan provides complete inter-organisation communications flexibility and contributes to the efficient use of available resources.

NOTE

A detailed report of the Tasmania Radiocommunication Plan is contained in accompanying papers (issued at the Study only)

TASMANIA RADIOCOMMUNICATION PLAN





A) Equipment 'Channel-Coding' Label (Example: As used by the Tasmania Fire Service (TFS) on modern 40 channel radio-transceivers) Appendix 3 (Page 1)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
F1	F2	F3	F4	F5	F6	F7	U1	U2	U3	T1	T2	T3	T4		N1	N2			
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
C1	C2	C3	C4	C5	C6	C7	C8	C9		F1	F2	F3	F4	F5	F6	F7			2

b) Tasmania Radiocommunication Plan Codes (Showing the combination of 'State Disaster' and 'Domestic Frequency Codes')

As at March 1983				STATE DISASTER RADIO FREQUENCY CODES			
ORGANISATION	LOCALITY	CODE		ORGANISATION	LOCALITY	CODE	
TFS (Country)	REG North Western, Southern	F1					
TFS (Country)	REG Northern	F2					
TFS (Country)	DIST North-East, South-West	F3					
TFS (Country)	DIST Hersey, Derwent	F4					
TFS (Country)	DIST West Coast, Tamar, East Coast	F5					
TFS (Country)	DIST Arthur, South East	F6					
TFS (Country)	DIST Midlands	F7					
TFS (Country)	State-wide (State Disaster)	Z					
TFS (Urban)	Hobart, Burnie, Devonport	U1					
TFS (Urban, Portables)	Hobart, Burnie, Devonport	U2					
TFS (Urban)	Launceston and New Norfolk	U3					
TFS (Urban, Portables)	Launceston	U1					
N.P.W.S.	State-wide	N1					
N.P.W.S.	State-wide	N2					
N.P.W.S.	State-wide	T1					
FORESTRY DIST	Burnie, Devonport, Norfolk, Triabunna	T1					
FORESTRY DIST	Deloraine, Newcastle, Launceston	T2					
FORESTRY DIST	Scottsdale, Queenstown	T3					
FORESTRY DIST	Fingal Smithton	T4					
FORESTRY DIST	Norfolk (Future)	T5					

ANNEX ECOMMUNICATION INFORMATION - CAIRNS AREA

As a general comment, it is appropriate to advise that a 5 metre surge at high water will effect approximately 85% of the City of Cairns, including the commercial centre which is located generally east of the railway.

Also, the Cairns District Counter Disaster Plan calls for the transfer of the operations centre from the Police Station to:-

1. Railway Station
2. R.F.D.S. Facility at Edge Hill if a storm surge of 3.68m is forecast. The plan also provides for substantial evacuation of Cairns and suburbs to high points.

Base stations or control points for communications systems operated by State Government Departments or agencies are within the 3.6 and 5 metre contours, and are therefore vulnerable. Contingency plans are based on the use of mobile/portable equipment to re-establish control and a pool of equipment is held by the State Emergency Service Regional Office in Cairns. Other pools are maintained in coastal Regional offices, as well as at State Headquarters.

Communications resources under State control are listed in Annex A, High Frequency, and Annex B, VHF. Specific frequencies are not shown, and the number of mobiles/portables available at any given time to services other than the State Emergency Service, varies on a day to day basis.

Other agencies which operate radio networks out of Cairns include:-

1. RFDS - HF
2. FNQEB - HF
3. Air Queensland - HF, to Northern and Gulf centres
4. Dept. of Aviation - HF and VHF
5. Telecom Australia - HF
6. Defence Department, H.M.A.S. Cairns
7. Cairns Fishing Industry, Limited Coast Stations, H.F.

Communications to other emergency services are primarily by telephone. Portable VHF radios would be employed as a back up to this service.

The Cairns State Emergency Service has a permanent Regional Operations officer and a clerical assistant.

A recent communications course conducted by State Headquarters trained 33 volunteer staff, in addition to volunteer members already trained. It is considered that the trained volunteer staff available is adequate to man State Emergency Service Communications facilities.

Further information will be available from the Queensland delegates at the Study.

CAIRNS COMMUNICATIONS, H.F.

1. State Emergency Service.

- a. Regional (1) 100w HF Base on State Network
- (2) 100 HF Mobile -8 frequencies fitted
- b. Local (1) 25w HF base
- (2) 25w HF mobile
- c. Pool 25w HF Portables
- d. 27MHZ Hand held - 27 units

2. Police Department.

HF to other Police Districts and isolated stations.

3. Main Roads Dept.

Remote controlled HF base.

CAIRNS COMMUNICATIONS, V.H.F.

1. State Emergency Service.

a. Buchans Point (Northern Reaches)

VHF base and 8 mobile/portable units. Base has capability of switching to McNamara St (Main Hq) frequency. All mobile/portable units are dual frequency.

b. McNamara St base also has capability of switching to Buchans Point base frequency. 8 mobile/portable units are dual frequency. Base is also capable of remote control from the Regional Office.

c. Gordon Vale/Aloomba base also has dual frequency capability. 2 mobile/portable are dual frequency.

d. Babinda base has dual frequency capability and 5 dual frequency portable/mobile units.

e. VHF ground/air 119.1 MHz located in Regional Pool.

2. Police.

Extensive VHF network operating north and south and to the Tablelands.

3. Main Roads Department.

VHF network with the base at Bellenden-Ker and UHF to Cairns office. A second VHF base is located at Laddle Mountain.

AUSTRALIAN COUNTER DISASTER COMMUNICATIONS STUDY -
- PRECIS OF N.S.W. STATE EMERGENCY SERVICES
AND CIVIL DEFENCE ORGANISATION, (HEREAFTER REFERRED TO
AS SES),

POSITION PAPER

INTRODUCTION

1. The NSW SES Organisation was formed in 1955. The State Emergency Services and Civil Defence Act, 1972 (as amended), gives statutory powers, authorities, duties and functions to the Director. In May 1955, Ministerial approval was given for the formation of a Communications Committee to examine existing and alternative systems of communications in districts where emergencies were likely to occur and to make appropriate recommendations for improvement where necessary. Organisations represented on the Committee were State Emergency Services, Police, Post Master General's Department, Army and RAAF.
2. Since 1955 the role of the Communications (Signal)* Service has expanded. The Service is designed to provide communications facilities for the passage of information to enable the Director to co-ordinate activities and exercise control in a worst case situation of a major disaster involving use of all state resources when a State of Emergency has been declared. The communications system also serves for the co-ordination of activities during lesser emergencies such as floods, cyclones etc. and the gathering of intelligence and other day to day activities.

* NOTE: The official title in N.S.W. is the "Signal Service". However, for ease of understanding and to conform with NDO, ACDC and other State/Territory Emergency Services the term "Communications Service" has been used, throughout the paper, in lieu of Signal Service.

DISCUSSION

Objectives

3. The Communications Service principal objectives are to provide essential communications for counter disaster

operational activities outlined at paragraph 2 above.

In general terms this is achieved by :

- a. Optimising the use of Telecom Australia communications services and facilities,
- b. Complementing Telecom Australia services and facilities with those of SES to provide control facilities within the Organisation and ensure co-ordination of activities, and
- c. To best utilize existing community communications resources for liaison and augmenting SES and Telecom Australia resources.

State Plan

4. State communications have been operationally tested on a number of occasions and have been satisfactory. However, there is a need for increasing the numbers of equipments and an on-going requirement to up-date and upgrade facilities.
5. The Plan provides for the needs of State Headquarters, 25 Division areas and some 175 local area organisations including Lord Howe Island. Each area has its own communications facilities and responsibility for local liaison with Telecom Australia and other organisations.
6. Communications facilities are provided for:
 - a. Operational control and the exchange of intelligence between headquarters and mobile units (vehicles, boats, aircraft and parties on foot) within each headquarter's areas of responsibility.
 - b. Transmission of information and requests to higher authority.
 - c. Receipt of instructions and information from higher authority.
 - d. Transmission of information to the general public.
 - e. Liaison with other departments and organisations.
 - f. Intercommunication within a headquarters.
 - g. Urgent contact with key staff members.

h. Operational training.

7. The prime means of point to point communications is the Telecom system using telephone and telegraph networks. Supporting systems are:

- * Messenger
- * Field Telephone equipment
- * Pocket Pager
- * Two-way Radio
- * The media - including direct broadcast facilities from a headquarters to radio station/s.
- * Voice over-ride of Background music systems to commercial and other premises.
- * Use of other organisations' communications facilities when circumstances so require.

Telecom Australia Facilities

8. Points of contact for liaison purposes have been established with the State Manager of Telecom for the handling of urgent matters. Circuit restoration, provision of additional facilities and alternative routing of circuits are matters upon which advice and/or action can be readily obtained.
9. Existing Telecom facilities are:

- a. Telephone. PABX facilities are installed at State Headquarters and PABX or PMBX facilities at each Division headquarters. A rationalisation programme is being carried out for all division headquarters and PMBX's are being replaced by Commander systems as funds permit. Most Local Headquarters have direct exchange lines, however, some have PABX or Commander systems. Supplementary facilities which may be installed include:

- * Tie lines
- * External extensions
- * Telephone answering and call diversion
- * Intercommunication
- * Paging

* Telecard

9. b. Telegraph. Telex machines are installed at State Headquarters and all division headquarters. A direct teleprinter link is installed from Bureau of Meteorology to State Headquarters. Some Local Headquarters have Telex facilities.
- c. Facsimile. Two only, facsimile services have been installed in one country division. It is proposed to install facilities at State Headquarters and some other divisions as funds and operational priorities permit. Two HF radios capable of interfacing with facsimile and Teleprinter equipment have been purchased. However, current priorities do not permit early use of this mode of transmission other than for conducting tests.

Radio Services

10. Radio is provided for:

- a. Operational control of mobile units within the respective headquarter's area of responsibility.
- b. Passing intelligence between mobiles and their respective headquarters and between fixed points such as dam sites and river gauge points.
- c. Passing of command information between headquarters and services in the field.
- d. Point to point communication where telephone or teleprinter circuits are unavailable or become overloaded or unserviceable.
- e. Backing of telephone and teleprinter services linking headquarters.
- f. Communication between mobiles.
- g. Ground to air communications.
- h. Training.

11. Current usage of radio is as follows:

- a. HF and VHF services in country areas.

- b. VHF and UHF in high density population areas.
 - c. HF, VHF and UHF in State Headquarters and selected Division Headquarters in the Sydney region.
12. State Headquarters Radio. Local HF (SSB) facilities in the 2-10 MHz band are provided. It is proposed to install HF remote receive facilities. Remote VHF (FM) base stations in the 165-170 MHz frequency range are installed. UHF talk through repeater (TTR) base stations are controlled from State Headquarters on 3 channels in the 458-468 MHz band. Two HF radio outstations have been established at Wildesmeadow and Glendale and are invaluable for radio relay purposes. Other outstations are to be established.
 13. Sydney Division Headquarters Radio. There are four Division Headquarters and 44 Local Headquarters in the Sydney Metropolitan area. All division Headquarters and most Local Headquarters have VHF radio. The VHF radio system is gradually being expanded to include all SES organisations in the Metropolitan area as funds become available. Selected headquarters in the Sydney Region are equipped with HF (SSB) radio equipment.
 14. Country Division Headquarters Radio. All Country Division Headquarters have HF (SSB) radio facilities. Many Country divisions have VHF radio and the system is being expanded. With the introduction of frequency synthesized equipment VHF talk through repeater bases are being installed where appropriate.
 15. Country Local Headquarters Radio. Almost all Country Local Headquarters have HF (SSB) radio and many have VHF radio. The VHF system is being expanded.
 16. Radio - General. Wherever feasible HF radio is being replaced by VHF radio. There is a considerable shortfall in the number of equipments required in the various frequency bands and many transceivers are obsolescent and require replacement. However, the basic networks are available. There is a small reserve of operational equipment held at State Headquarters to meet any urgent demand. A frequency rationalization programme is being carried out. A fourth UHF channel is available for communication between organisations involved in disaster control but it has not yet been developed.

Personnel and Training

17. There is a permanent staff of 7, including 3 radio technicians, at State Headquarters. All other staff are volunteer members. Each division and most local headquarters have a volunteer communications officer assisted by other volunteer members.
18. The number of trained volunteer communications personnel available in each area fluctuates from time to time. The standard of knowledge, experience and training also varies considerably. In the main, mobile and portable radios are operated by users rather than communications staff.
19. Training classes and exercises are conducted by Division and Local headquarters on an on-going basis. However, the standard of proficiency varies between Divisions and also between Local organisations.
20. To assist towards overcoming the lack of Communications instructors, training pamphlets and other materials, Programmed Self Instructional Packages for the various subjects for which this application is suitable are being compiled at State Headquarters.

SUMMARY

21. The Communications Service is being gradually improved and expanded as funds permit. In the more recent operations the system, based upon Telecom facilities as the prime means of point to point communications with back-up from other resources, has been adequate. However, there still remains a shortfall in facilities to meet requirements for more serious disasters.
22. A continuing programme of expanding and updating the system is being carried out. The need for improvement is related to the training of volunteer staff in addition to the provision of facilities. Deficiencies are gradually being overcome as time, staffing and funds permit.

AUSTRALIAN COUNTER-DISASTER COMMUNICATIONS STUDY

VICTORIA POSITION PAPER

INTRODUCTION

1. In Victoria, the State Disaster Plan (DISPLAN) establishes guidelines for Authorities, Departments and voluntary organizations at local, regional and State levels, so that they may prepare operational and supportive plans designed to function in times of disaster. DISPLAN does not have legislative backing and consequently relies on mutual co-operation that exists between the participating organizations.
2. The communications requirements of participating authorities in day to day situations are basically met by their private radio systems, as well as normal Telecom Australia facilities. However, experience has shown that during major disasters, Telecom facilities require supplementing with point to point landlines for the following reasons:-
 - (a) Higher than normal communications traffic by participating authorities exceeding their operational radio facilities;
 - (b) Increased public use of the Telecom network resulting in congestion and restricting its use by the participating authorities.
3. Participating authorities under DISPLAN are responsible in disaster situations for:-
 - (a) The adequacy of their private radio systems;
 - (b) Initiating negotiations with Telecom Australia for the provision of landlines to supplement their radio system, to bypass Telecom network congestion and to satisfy their own communications needs.

DISCUSSION

Co-ordination

4. The Chief Commissioner of Police is the Co-ordinator of DISPLAN in Victoria. In the event of a disaster, it is a Police responsibility to ensure co-ordination of the means

of providing the most effective support to authorities directly responsible for combating the disaster and to the assisting services. As a consequence Victoria Police have a very efficient and comprehensive communication system throughout the State.

5. Victoria Police and most of the major organizations within DISPLAN, handle and cope with disasters of a minor nature as a daily routine. Major disasters are no different, and require an infusion of sufficient resources to cope with the problem. They are in fact an extension of their normal day to day activities. Victoria Police and the other organizations are continually improving and extending the capabilities of their communications systems.

Disaster Headquarters

6. Within DISPLAN, State Disaster Headquarters is located at the Police Operations Centre, Russell Street, Melbourne. When activated, and dependant on the type of disaster, comprises the Co-ordinator, Chiefs of Divisions or their Emergency Services Liaison Officers (E.S.L.O.) and Staff Officers as required.

Disaster Regions

7. The State of Victoria is divided into twenty-five (25) country and outer metropolitan regions and a Melbourne Metropolitan Displan region. Each of the twenty-five regions have a Regional Disaster Committee under the Chairmanship of the Regional Co-ordinator who is always a Police Officer.

Regional and Specific Plans

8. Regional and specific counter-disaster plans have been prepared under DISPLAN guidelines. The plans have been tested and found to be satisfactory and the contact details are constantly being updated.

9. Regional Disaster Plans include the establishment of Regional Disaster Headquarters and specify their location which would be used as the Regional Emergency Operations Centre.

Communications System

10. Victoria Police communications consist of:-

- (a) V.H.F., 10-Channel service throughout the State, supplemented by H.F. in the more remote and mountainous areas;
- (b) U.H.F., 4-Channel for additional use in the

metropolitan area and in conjunction with portable or mobile base repeaters;

- (c) Telephone - Statewide Telecom exchange and direct lines to selected Police Stations and authorities;
- (d) Telex for interstate messages;
- (e) Computer - used also for message switching in lieu of Telex;
- (f) Facsimile.

Radio Network

11. The Victoria Police radio network for day to day operations and emergency situations operate in the "clear" or "voice unprotected" mode. The system involves the use of the ten (10) V.H.F., four (4) U.H.F. thirteen (13) H.F. and one (1) aeronautical frequency which are for the exclusive use of the Police. They also operate on the normal marine V.H.F. and 27 meg. (C.B.) frequencies when necessary but not exclusively.

Telephone Network

12. As well as the normal Telecom telephone system of exchange lines at all Police Stations, direct telephone lines from emergency services, and numerous participating authorities under DISPLAN as well as selected 24-hour Police Stations in the metropolitan area, are connected to the Control Room, Melbourne.

13. Ancillary to that network, the Police Operations Centre has a lines connecting panel for the provision of point to point direct telephone lines for disaster co-ordination and support communications. Connection can be made throughout Australia and within Victoria to any part of the State where pre-planned disaster communications lines have been established, or a disaster field location.

Base Stations

14. Various base stations for H.F., V.H.F. and U.H.F. systems are located throughout Victoria. At times, topographical features prevent coverage of an incident from the established base sites. Under these circumstances use is made of mobile communication units, one of which is designed to act as a remote base.

Field Communications Units

15. Three field communications units, each with portable generators for power supply, are on standby in Melbourne and can be quickly activated with trained communicators to proceed to any part of the State. They are equipped to provide H.F., V.H.F. and U.H.F. radio. Two can provide telephone and one telex and portable facsimile facilities after connection to a normal Telecom landline.

Mobile Transceivers

16. Victoria Police currently are equipped with the following mobile transceivers:-

H.F.	-	38
V.H.F.	-	2,209
U.H.F.	-	28

17. These in the main are installed in operational police units dispersed throughout the State at Police Stations, Traffic Operations Groups and Crime Divisions. All V.H.F. transceivers are ten channel sets, capable of operating throughout the State. H.F. transceivers are fitted into some units that operate in country areas which are dual fitted with V.H.F.

Portable Transceivers

18. (a) H.F. The Police Search and Rescue Squad have eight (8) H.F. portable transceivers, which are the total number throughout the Police Force.
- (b) V.H.F. There is a total of 361 V.H.F. portable transceivers varying types and channel capacity.
- (c) U.H.F. A total of 200 U.H.F. portable transceivers are used within the metropolitan area.

49	1 watt	1 channel (1)
41	1 watt	4 channel
110	5 watt	4 channel

Control Centres

19. The Control Room, referred to as "D.24" is located

at the Police Offices, Russell Street, Melbourne, and is the control centre for the Metropolitan Police Districts. It operates continuously and is staffed by trained communications personnel. It incorporates the Police Operations Centre, which as previously stated is the State Disaster Headquarters.

20. The operations of D.24 and the use of the Special Operations Centre can be related (in smaller form) to existing District Operations Centres in Ballarat ("C" District), Geelong ("J" District), Bendigo ("G" District) and Morwell ("D" District), which are operated by trained communicators. As the V.H.F. system in the Country Districts is not currently linked to one central District location, operations are controlled at local level, usually from Police Stations which have low powered bases.

Trained Communications Personnel

21. Currently there are 252 authorized police personnel who perform full-time communications operating duties. Thirty-two of these are deployed at the Ballarat, Geelong and Morwell Control Rooms. The remainder are attached to D.24 Melbourne.

22. An innumerable number of previously trained communications personnel who were attached to D.24 and have transferred to operational duties may well be available to staff counter-disaster communications facilities for a large scale disaster. It is estimated that about 30% of existing D.24 personnel would be available with the cancellation of leave and rest days, as was the case during the C.H.O.G.M. operation in Melbourne in 1981. Part-time or volunteer personnel outside the police organization do not operate police communications equipment.

CONCLUSION

Victoria Police and most of the major combating authorities in Victoria do have their own efficient radio communications although some of the organizations did have communication problems at some stages during the "Ash Wednesday" disaster. Many of the other organisations, particularly the volunteer-type, experienced considerable difficulty as they relied upon telephonic communications which did "break-down", only due to the overloading by the enquiries generated.

ACT POSITION PAPER

FOR

ACDC COMMUNICATIONS STUDY

24-27 JULY 1983

Introduction

The ACT is not in a disaster prone area, however, a new ACT Disaster Plan is nearing finalisation. It is intended that supporting legislation will be prepared in due course.

If the plan is activated, ie. when the authority responsible for the particular occurrence is unable to control and co-ordinate all the resources needed to cope with the situation, a Controller Counter-Disaster Operations, responsible to the Minister for Territories and Local Government, takes control of all ACT Counter-Disaster resources. The Territory Controller is the Chief Superintendent, ACT General Policing Division, Australian Federal Police.

For ease of control and co-ordination, all participants in the Plan are grouped into Functional Service groups under the control of a Functional Service Co-ordinator.

Communications Functional Service

One of the Functional Services is Communications, with an Australian Federal Police Officer appointed as Communications Co-ordinator.

This Functional Service has not been formally co-ordinated as yet, but it will comprise representatives from all authorities/organisations that can contribute meaningful communications in times of disaster.

ACT Disaster Control Net

Several years ago, the Department of the Capital Territory provided the finances to establish a VHF Disaster Control Net to link the key counter-disaster authorities in the ACT.

This Net has been extended over the past year to include the following authorities:

- * Australian Federal Police (Control Station)
- * ACT Fire Brigade

- * Capital Territory Health Commission
- * ACT Emergency Service
- * Conservation and Agriculture Section (Territories and Local Government)
- * Welfare Branch (Territories and Local Government)
- * ACT Bushfire Council
- * Natural Disasters Organisation
- * ACT Regional Office, Department of Housing and Construction

In the event of a telephone failure, or in the event of an emergency or disaster, the ACT Disaster Control Net may be activated to provide essential communications between key counter-disaster authorities.

Summary of Communications Available for Counter-Disaster Purposes

Attached are annexes which summarise the communications under the control of ACT counter-disaster authorities. (1) The ACT is well endowed with communications, when, in addition to those communications summarised in the Annexes, those of the Department of Administrative Services, the Department of Transport and Construction, Regional Office Telecom and private enterprise are included.

Conclusion

Within 12 months, the communications resources of the ACT will have been co-ordinated into the Communications Functional Service to support the ACT Disaster Plan in the event of a disaster.

(1) Annexes were issued at the Study but have not been included for publication.

AUSTRALIAN COUNTER-DISASTER COMMUNICATIONS STUDY

TASMANIA EMERGENCY COMMUNICATIONS ARRANGEMENTS

INTRODUCTION

1. Counter-disaster planning is carried out in Tasmania by the State Emergency Service under the authority of the Emergency Services Act 1976. The Tasmania Counter Disaster Plan includes emergency communications arrangements.

AIM

2. The aim of this paper is to outline the major aspect of the Communications Plan.

PLANNING RESPONSIBILITIES

Communications

3. To carry out the specialist role of counter-disaster communications planning, the Director of the State Emergency Service established the State Disaster Communications Planning Committee. This Committee was established in 1978 and comprises representatives of all State Government Departments with significant communications facilities, Telecom, the Department of Communications, which provides technical advice and assistance whilst retaining its mandatory role for radio frequency management, WICEN and a representative of the Municipal Councils. Two other Sub-committees have also been formed, namely the State Disaster Radio Plan Sub-committee and the Radio Technical Sub-committee. The Radio Plan Sub-committee comprises those members of the State Disaster Communications Planning Committee who have significant radio systems and senior representatives of Department of Communications. The Radio Technical Sub-committee comprises Technical Officers from the various Government Departments plus Telecom and WICEN.

State Disaster Communications Planning Committee

4. This Committee has the overall responsibility for emergency communications planning within Tasmania and in addition considers any day to day communications problems put before it by Government Departments or other agencies. The Committee also has the overall responsibility for the selection of radio equipments for the State tendering system. The Department of Communications and Telecom do not participate in the selection of equipments.

5. The Committee is responsible for ensuring that all forms of communication are properly co-ordinated and integrated for not only day to day purposes, but also for all emergency purposes.

Radio Plan Sub-Committee

6. This sub-committee meets on a regular basis and carries out the detailed operational planning concerned with the Tasmania Radio Communications Plan; also day to day problems are presented to it by other Departments or agencies for assistance. The Department of Communications' representative on this sub-committee provides invaluable technical advice and guidance on all radio frequency planning matters.

Technical Sub Committee

7. This Sub-committee carries out the evaluation of the equipment submitted for State Government tender and provides technical input to the State Disaster Communications Planning Committee.

COUNTER DISASTER COMMUNICATIONS METHODS

8. All types of communications in use within Tasmania are included in the State Disaster Communications Sub-plan. These types include:

- a. Radio
- b. Telephone
- c. Telex
- d. Facsimile

Radio

9. Tasmania has a unique Disaster Radio Plan in that the majority of radio systems operated by State Government Departments, all radio systems operated by Emergency Services, all municipal radio systems and all radio systems operated for special disaster purposes, comprise a disaster radio system known as the Tasmania Radio Communications Plan.

10. Each Department, Agency, Municipality etc, has its own radio plan comprising its own frequency or frequencies. These systems are used by that organisation on a day to day basis for administrative or emergency purposes. All of the frequencies used by these organisations are contained within the frequency range 76 to 79 MHz.

Tasmania Radio Communications Plan

11. The Tasmania Radio Communications Plan provides that these frequencies are used by the licensee under normal circumstances, but in any minor emergency or disaster situation, all organisations have the ability to switch to each other's frequency depending upon the need. The Plan allows organisations to carry out the frequencies of other organisations, as necessary, for emergency purposes. In addition there is one common frequency entitled the State Disaster Frequency which is contained in all radio sets within the Plan.

12. This Plan provides for various levels of communications control and co-ordination during an emergency situation. The frequencies of the various Emergency Services are used primarily for overall command, control and co-ordination of their own organisations at State, regional and municipal level. Many Departments, agencies and municipalities carry the frequencies of other organisations and during any emergency can operate on each other frequencies.

13. This arrangement allows for a complete inter-organisational and flexible communications plan.

14. At municipal level, each municipal radio network becomes the local disaster radio network for that particular municipality during an emergency situation. All other Emergency Services can operate on that frequency for that particular emergency situation for liaison and co-ordination purposes, or on their own frequencies.

15. The State Emergency Service radios carry the frequencies of all organisations, thus permitting it to operate on any organisational network or allocate the equipment to any organisation for use during an emergency. The State Emergency Service frequencies are used as the State Disaster Executive command network and also for co-ordination of resources. The use of these frequencies is limited to senior officials in other organisations.

16. The State liaison frequency which is contained in all radio sets can be used as a co-ordination/liaison frequency at a particular emergency site, such as the equivalent of the Mt St Canice incident or Granville train crash etc. This allows for all organisations to co-operate and liaise on the one frequency and still retain their own frequencies for their own purposes.

17. The State Emergency Service, Police Department and Tasmania Fire Service each have mobile radio base stations mounted in four-wheel drive vehicles. These base stations contain their own frequencies and in the case of State Emergency Service contain other organisations' frequencies. All mobile base stations carry the State liaison frequency. These vehicles can be deployed to any site and provide an on-site base station. Certain mobile base station vehicles have their own portable control link facilities.

18. Until recently the Tasmania Radio Communications Plan was limited to a switching range of approximately 1 MHz as radio equipment could not accommodate frequencies greater than 1 MHz apart.

19. With the introduction of new generation equipment with a switching range of 3 MHz, the Tasmania Radio Communications Plan has now been extended to 3 MHz.

20. The Tasmania Radio Communications Plan is unique, not only in Australia, but in the world and it has proved efficient during emergency situations in Tasmania.

Telephone

21. The telephone network is the primary means of fixed communication during any emergency situation until such time as it is no longer viable. Under normal situations the telephone network will be used to its utmost. To supplement the normal telephone system there are three State Disaster switchboards located in the three Region emergency Operations Centres, and these switchboards contain direct lines to the Emergency Operations Centres of other organisations and to important Departments and agencies. The switchboards are used to provide a means of communication should the public network become jammed. In addition Telecom have available portable radio telephone communications which can be located at a disaster scene should the normal system be inoperative. The Telecom Plan provides for additional exchange lines at all Emergency Operations Centres and additional lines at each municipal Operations Centres and nominated welfare centres.

Telex.

22. The normal Telex system is fully utilised during any emergency situation and telexes are located at all Emergency Operations Centres. A portable telex facility is available for field deployment.

Facsimile

23. The normal Facsimile system is fully utilised during any emergency situation and facsimiles are located at all Emergency Operations Centres.

EMERGENCY OPERATIONS CENTRES

24. Each organisation has its own Emergency Operations Centre for use for normal operations and during any emergency or state of disaster. Most Emergency Operations Centres are connected by direct lines, telex or facsimile. The regional Emergency Operations Centres are located at Hobart, Launceston and Burnie, and municipal Emergency Operations Centres are located in the relevant municipalities.

The State control centre for each organisation is located in Hobart and the control centre for co-ordination purposes and the implementation of instructions from the State Disaster Executive, is located at the State Emergency Service Hobart.

SUMMARY

25. The Tasmania State Disaster Communications Plan is complex but efficient and is designed to provide the necessary communications when and where required. However the Plan is constantly being reviewed and updated to reflect new technology equipment and lessons learned during emergency situations.

COUNTER DISASTER COMMUNICATIONS

S.A. POSITION PAPER

1. South Australian State Disaster Plan (1980)

1.1 In S.A. the State Disaster Plan established guidelines for authorities and voluntary organisations at local, regional and State levels, so that they may prepare operational and supportive plans designed to function in times of disaster.

1.2 Responsibility for State Planning is vested in a State Disaster Committee appointed under the Act, comprising of:

- .. a representative from the Premier's Department
- .. Commissioner of Police
- .. Director General, Engineering and Water Supply Department
- .. Chairman of the Health Commission.

1.3 Geographic areas

The State is divided into two main areas,

- .. the Greater Adelaide Metropolitan,
- .. the remainder of the State, outside of Metropolitan Adelaide, based on the Police Divisional areas which align generally with individual local government areas has been adopted for organisational purposes.

2. Elements of Adelaide Metropolitan Disaster Plan

2.1 Emergency Operations Centre. The Emergency Operations Centre which is located at Central Police Headquarters, Angas Street, Adelaide or, if necessary, an alternative location is to keep or maintain a total overview of a disaster operation and determine priorities to be allocated to counter disaster measures. Records and displays of the situation are maintained to assist the State Co-ordinator to make operational decisions.

N.B. The Police Operations Centre acts as the ex-officio E.O.C. until that Centre is manned and operational.

2.2 State Co-ordinator

The Commissioner of Police is the nominated State Co-ordinator, and is the responsible person to plan, direct and co-ordinate counter disaster measures.

2.3 Liaison Officers

When the E.O.C. is activated and as required each Functional Service assigns a liaison officer to report at the E.O.C. for,

- .. briefing purposes
- .. establish a communications link between the E.O.C. and his respective State Control Centre
- .. as required provide advice to the State Co-ordinator.

2.4 State Contact Centres (S.C.C.)

The Controller of each of the 12 Functional Services forming components of the State Disaster Plan establishes a State Control Centre from which they will be responsible for the planning, directing, controlling, and co-ordination of their departments, utilities, organisations, or groups being part of their Functional Service.

2.4.1 Organisational Structure

Each Functional Service is organised in outline as follows:

- a. State Control Centre - under a State Controller
- b. Divisional Control Centre - under a Divisional Controller
- c. Local Control Centre - local Police District level under a Local Controller

Police territorial boundaries which align generally with Local Government

areas have been adopted for organisational purposes.

2.5 Appointment of Controllers

Functional Service Controllers at State level are appointed by the State Disaster Committee acting under the authority of Cabinet.

Divisional and Local Co-ordinators are Senior Police Officers and have the appointment by virtue of their role and position on a day to day basis.

2.5.1 Responsibilities and Powers of State Controllers

State Controllers are responsible for:

- a. preparing a plan of action for inclusion as part of the State Plan;
- b. training of personnel;
- c. implementing the Plan at the direction of the State Co-ordinator; and
- d. the co-ordination of participating organisations within their Functional Service and for providing these Services when necessary.

Control of the individual units of participating services and their method of operation, remains the responsibility of the authority providing the service.

3. ACTIVATION OF THE PLAN

3.1 Alert Stage

If at any time it appears to the State Co-ordinator that a disaster is imminent, is taking place or has occurred he may declare an alert stage and take immediate action to inform the Minister of the South Australian Government responsible for the administration of the State Disaster Act.

3.1.1 Action by the Emergency Operations Centre

The Emergency Operations Centre will:

- (a) Open all communication facilities in the E.O.C. and confirm the functioning of communication networks.

- (b) Establish communication links with State Controllers.
- (c) Activate functional services as required by advising State Controllers of the disaster threat and likely action required.
- (d) Alert the public.
- (e) Initiate action for the diversion of those members of the public and public services likely to be affected by the disaster.
- (f) Take any other action as directed by the State Co-ordinator.
- (g) Notify the Natural Disasters Organisation.

3.2 If on the advice of the State Co-ordinator the Minister is satisfied that a state of disaster does exist and thus warrants a declaration he may make such declaration.

On such declaration :

3.2.1 Action by the E.O.C.

- (a) Notify State Controllers that a disaster stage exists - give a warning order as appropriate.
- (b) Implement action under the alert stage as appropriate including notification of Natural Disasters Organisation.
- (c) Arrange for public announcement that a disaster stage exists.
- (d) Initiate counter-disaster measures.
- (e) Take any other action as directed by the State Co-ordinator.

3.3 Rundown Phase

The E.O.C. will, on the direction of the State Co-ordinator on being satisfied that

the danger is minimal and can be adequately met utilizing normal resources, scale down the operation of the E.O.C. and pass the control function back to the Police Operations Centre.

Each Functional Service conducts an individual debriefing and later the State Co-ordinator conducts a joint debriefing of the Functional Services for his report to the Government.

4. FUNCTIONAL SERVICES COMBATING AUTHORITIES

- 4.1 Armed Services - to give support, as available, to other Functional Services.
- 4.2 Catering - to enable the mass feeding of disaster victims and the provision of meals to members of the combating services.
- 4.3 Communications - to establish and maintain a communications system for the State Disaster Organisation.
- 4.4 Engineering - to restore, where necessary and maintain essential services and give support to other Functional Services in counter-disaster measures.
- 4.5 Fire - to control and arrest outbreaks of fire and give support to other Functional Services in counter-disaster measures.
- 4.6 Health and Medical - to
 1. take measures to preserve the health of the community and provide hospital and medical services required as a result of the disaster
 - and
 2. arrange for scientific and veterinary services as required.
- 4.7 Media - to provide current, factual, authoritative information to the public, and other interested parties on the disaster, for the purpose of alleviating public concern, issuing warnings, seeking public assistance and advising of counter-disaster measures being taken.
- 4.8 Police - to carry out initial reconnaissance. To maintain law and order and protect life

and property. To give support to other Functional Services.

- 4.11 Transport - to meet transport requirements of other Functional Services.
- 4.12 Welfare - to provide middle-term relief to disaster victims including the provision of accommodation and other basic daily needs. To register victims.

5. COUNTER-DISASTER COMMUNICATIONS

Generally the telephone and Telex services provided by Telecom Australia will be regarded as the primary means of communication to maintain effective control. When this facility is unavailable, or cannot provide the degree of flexibility required, radio networks will be established.

5.2.1 RADIO

E.O.C./SCC Communication Links	Appendix 'A'
E.O.C./SCC Frequencies	Appendix 'B'
Location of S.C.C.'s	Appendix 'C'
Defence - Base Sites	Appendix 'D'
Engineering - Base Sites	Appendix 'E'
S.E.S. - Base Sites	Appendix 'F'
Fire - Base Sites	Appendix 'G'
Health - Base Sites	Appendix 'H'
Police - Base Sites	Appendix 'I'
Transport - Base Sites	Appendix 'J'
Welfare - Base Sites	Appendix 'K'

5.2.2 COMMUNICATION (RESERVES)

POLICE Appendix 'L'

WICEN

C.B. ORGANISATIONS

RADIO EQUIPMENT SUPPLIERS

DEFENCE

TELECOM

5.2.3 TELEPHONE

Police (Interlinked S.C.P.
PABX system)

Telecom Exchange Network

Appendix 'M'

*

5.2.4 TELEX

Police (39 units)

5.2.5 FACSIMILEPOLICE

Vocadex at Central Headquarters (model 4200)
Base Stations (6 units - Plessey)
Field (2 units - Model 1100 Vocadex)

5.2.6 Media Broadcast Availability Commercial Stations

AM/FM Radio and T/V stations Appendix 'N'

*

5.2.7 Schedule of Radio Equipped Mobiles Appendix 'O'

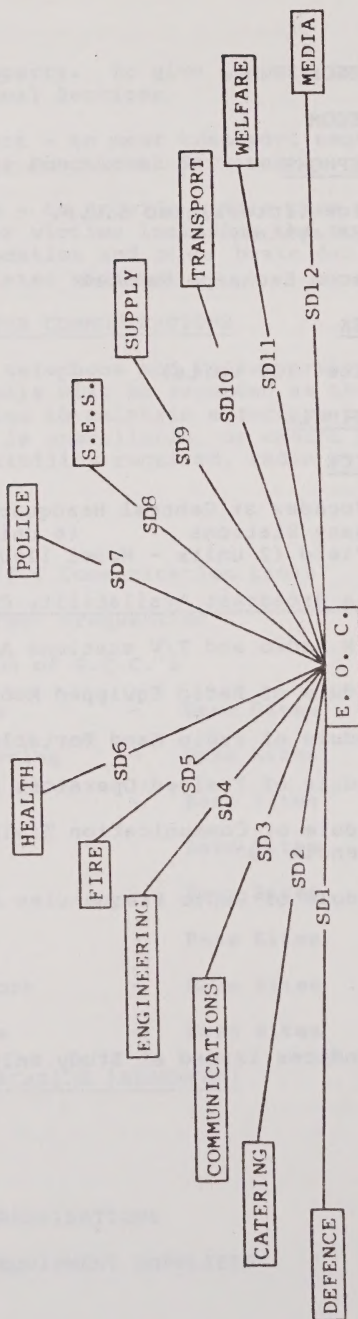
5.2.8 Schedule of radio Hand Portables Appendix 'P'

5.2.9 Schedule of Trained Operators Appendix 'Q'

5.2.10 Schedule of Communication Training Programmes
Appendix 'R'

5.2.11 Schedule of Radio Frequencies Appendix 'S'

* These Appendices issued at Study only.

STATE DISASTER ORGANISATIONEMERGENCY OPERATIONS CENTRE/STATE CONTROL CENTRECOMMUNICATION LINKS

STATE DISASTER NETWORKAPPENDIX 'B'EMERGENCY OPERATIONS CENTREPOLICE HEADQUARTERS, ADELAIDE

FUNCTIONAL SERVICE	STATE CONTROL CENTRE
(D) DEFENCE	KESWICK BARRACKS
(C) CATERING	EDEN PARK TRAIN- ING CENTRE, THE CRESCENT, MARRYATVILLE.
(E) ENGINEERING	E & W.S. THEBARTON
(F) FIRE	M.F.S. HEAD- QUARTERS, WAKEFIELD STREET, ADELAIDE.
(H) HEALTH	ST. JOHN AMBULANCE HEAD- QUARTERS, GREENHILL ROAD, EASTWOOD.
(P) POLICE	POLICE OPERATIONS CENTRE, 9TH FLOOR, NORTH, CENTRAL HEAD- QUARTERS, ANGAS STREET, ADELAIDE.
(S) S.E.S.	S.E.S. HEAD- QUARTERS, THEBARTON BARRACKS
(U) SUPPLY	153 GREENHILL ROAD, PARKSIDE

FUNCTIONAL SERVICE

STATE CONTROL
CENTRE

(T) TRANSPORT

S.T.A. DEPOT,
HACKNEY

(W) WELFARE

G.R.E. BUILDING,
50 GRENFELL ST.,
ADELAIDE

STATE DISASTER PLAN FUNCTIONAL SERVICESRADIO BASES (METROPOLITAN AREA)FREQUENCY
BAND

LOCATION

POLICE

UHF/VHF	Ridge Road, SUMMERTOWN
UHF/VHF	Cherry Gardens Road, CHERRY GARDENS
UHF/VHF	Mt. Lofty Summit Road, MOUNT LOFTY
UHF/VHF	Range Road North, UPPER HERMITAGE (TEA TREE GULLY)
VHF	Ocean View Crescent, MOUNT OSMOND
VHF/HF	Angas Street, ADELAIDE
VHF	Adelaide Airport, Burbridge Road, WEST BEACH
HF	Police Academy, Strathfield Terrace, TAPEROO
UHF	1 King William Street, ADELAIDE (AMP)
UHF	Woodville Road, WOODVILLE SOUTH (QEH)

WELFARE

VHF	Ridge Road, SUMMERTOWN
VHF	Glen Stuart Road, MAGILL
VHF	Cavan Road, DRY CREEK

HEALTH

VHF	Hillcrest Avenue, STIRLING
VHF	Range Road North, UPPER HERMITAGE
VHF	Majors Road, O'HALLORAN HILL
VHF	Sheoak Road, UPPER STURT
VHF	South Road, WEST HINDMARSH
VHF	St. John Ambulance Headquarters, Greenhill Road, EASTWOOD
UHF	St. John Ambulance Headquarters, Greenhill Road, EASTWOOD

S.E.S.

HF/VHF	Thebarton Barracks
HF/VHF	Hoods Road, ENFIELD
HF	Education Road, HAPPY VALLEY
HF/VHF	Princes Road, MITCHAM
VHF	Lindsay/Brian Road, LONSDALE

FIRE (M.F.S.)

VHF	Ridge Road, SUMMERTOWN
VHF	Majors Road, O'HALLORAN HILL
VHF	Tynte Street, NORTH ADELAIDE
VHF	Quartz Hill, YALLALUNGA

SUPPLYNil

CATERINGNil

TRANSPORTS.T.A.

VHF/UHF	Range Road North, UPPER HERMITAGE
UHF	Port Stanvac Railway Station
UHF	Glanville Railway Station
UHF	Bridgewater Railway Station
VHF/UHF	Hillcrest Avenue, CRAFTERS
UHF	Footes Hill Road, UPPER STURT
VHF	AMP Building, 1 King William Street, ADELAIDE
UHF	Sun Alliance Building, 45 Grenfell Street, ADELAIDE
VHF	Marble Hill Road, ASHTON

GLENELG TAXIS

VHF	Majors Road, O'HALLORAN HILL
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UNITED YELLOW TAXIS

VHF	Gothic Avenue, STONYFELL
VHF	Ocean View Crescent, MOUNT OSMOND
VHF	Majors Road, O'HALLORAN HILL
VHF	Range Road South, HOUGHTON

TRANSPORT (continued)
SUBURBAN TAXIS

VHF	Ocean View Crescent, MOUNT OSMOND
VHF	Ridge Road, SUMMERTOWN
VHF	College Road, KENT TOWN
VHF	Aerial Road, BELAIR

DEFENCER.A.A.F.

HF/UHF	R.A.A.F. Base, EDINBURGH
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ARMY

HF/VHF	4MD Headquarters, KESWICK
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ENGINEERINGS.C.C.

VHF	Deviation Road, THEBARTON
UHF	Ridge Road, SUMMERTOWN

P.B.D.

VHF	Watson Avenue, NETLEY
VHF	Majors Road, O'HALLORAN HILL
VHF	Ridge Road, SUMMERTOWN
VHF	Carrington Street, ADELAIDE
VHF	Wakefield Street, ADELAIDE

SAGASCC

VHF	Ridge Road, SUMMERTOWN
VHF	Aerial Road, BELAIR
VHF	Range Road North, UPPER HERMITAGE

E.&W.S.

HF	Ridge Road, SUMMERTOWN
VHF	Ridge Road, SUMMERTOWN
VHF	Range Road, TEA TREE GULLY
VHF	Tapleys Hill, HAPPY VALLEY

HIGHWAYS DEPT.

VHF	Ridge Road, SUMMERTOWN
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E.T.S.A.

VHF	MOUNT LOFTY SUMMIT
VHF	NORTHFIELD

FREQUENCY
BAND

LOCATION

FIRE (C.F.S)

HF/VHF/UHF	West Beach Road, KESWICK
UHF	MOUNT LOFTY SUMMIT (ADS 7 TOWER)
VHF	Myponga Hill, MYPONGA
VHF	MEADOWS
VHF	STRATHALBYN
VHF	PORT NOARLUNGA
VHF	CHERRY GARDENS
VHF	HAHNDORF
VHF	BELAIR
VHF	SUMMERTOWN
VHF	Nitschke Hill
VHF	Norton Summit
VHF	Athelstone
VHF	Mount Bold
VHF	Lower Hermitage
VHF	Salisbury
VHF	Mount Pleasant
VHF	One Tree Hill
VHF	Quartz Hill, YALLALUNGA

POLICE NETWORK - BASE STATIONS (METROPOLITAN)

LOCATION

Central Police Headquarters,
Angas Street,
ADELAIDE.

Police Academy,
Strathfield Terrace,
TAPEROO.

Ridge Road,
SUMMERTOWN.

Cherry Gardens Road,
CHERRY GARDENS.

Summit Road,
MOUNT LOFTY.

Range Road North,
UPPER HERMITAGE.

Ocean View Crescent,
MOUNT OSMOND.

Central Police Headquarters,
Angas Street,
ADELAIDE.

AMP Building,
1 King William Street,
ADELAIDE.

LOCATION

Queen Elizabeth Hospital,
Woodville Road,
WOODVILLE SOUTH.

Range Road North,
UPPER HERMITAGE.

Cherry Gardens Road,
CHERRY GARDENS.

Ridge Road,
SUMMERTOWN.

Summit Road,
MOUNT LOFTY.

POLICE NETWORK - BASE STATIONS (COUNTRY)LOCATION

MURRAY BRIDGE	PETERBOROUGH
COONALPYN	PORT PIRIE
MENINGIE	YUNTA
BORDERTOWN	ANDAMOOKA
KEITH	COOBER PEDY
KINGSTON	LEIGH CREEK
MILLICENT	MARREE
MOUNT GAMBIER	CODNADATTA
NARACOORTE	PORT AUGUSTA
BERRI	WOOMERA
BLANCHETOWN	CEDUNA
PINNAROO	PENONG
YORKETOWN	PORT LINCOLN
BURRA	KIMBA
COCKBURN	WHYALLA
MANNAHILL	KINGSCOTE

MURRAY BRIDGE	PORT WAKEFIELD
BORDERTOWN	SNOWTOWN
KEITH	CRYSTAL BROOK
CLARE	GLADSTONE
NURIOOTPA	PETERBOROUGH
MILLICENT	PORT PIRIE
MOUNT GAMBIER	COOBER PEDY
NARACOORTE	PORT AUGUSTA
PENOLA	CEDUNA
ROBE	PORT LINCOLN
BERRI	WHYALLA
LAMEROO	KINGSCOTE
MORGAN	VICTOR HARBOUR
PINNAROO	LEIGH CREEK
WAIKERIE	DARTMOOR)
KADINA	EDENHOPE) VICTORIA
MAITLAND	KANIVA)
MINLATON	CASTERTON)

POLICE NETWORKNUMBER OF MOBILES

TYPE	METRO	COUNTRY
HF (SSB)	6	109
VHF	586	152
VHF (TARTA)		4
UHF (TARTA)	5	1
UHF	10	

NUMBER OF PORTABLES

TYPE	METRO	COUNTRY
HF (CB)	6	
VHF	57	20
UHF	183	28
VHF/UHF (LINK)	25	

APPENDIX 'O'SCHEDULE OF RADIO EQUIPPED MOBILES

(GREATER ADELAIDE AREA)

COUNTER DISASTER SERVICE	MOBILES			
	H.F.	LOW-BAND V.H.F.	HI-BAND V.H.F.	U.H.F.
POLICE	6	586	-	15
FIRE (M.F.B.)	-	-	112	-
FIRE (C.F.S.)	11	-	225	20
MEDICAL	-	-	315 (State- wide)	2
S.E.S.	10	-	48	-
TRANSPORT	-	531	1027	512
WELFARE	-	3	19	-
SUPPLY	-	-	-	-
DEFENCE	Various	-	-	Various
CATERING	-	-	-	-
MEDIA	-	-	-	-
ENGINEERING	60	12	1025	5

SCHEDULE OF RADIO HAND PORTABLES

(GREATER ADELAIDE AREA)

COUNTER DISASTER SERVICE	HAND-PORTABLES			
	H.F.	LOW BAND V.H.F.	HI-BAND V.H.F.	U.H.F.
POLICE	6	82	-	183
FIRE (M.F.B.)	-	-	61	-
FIRE (C.F.S.)	-	-	74	-
MEDICAL	110 (State- wide)	-	19 (State- wide)	17 (Metro)
S.E.S.	47	-	14	-
TRANSPORT	-	-	14	12
WELFARE	-	-	-	10
SUPPLY	-	-	-	-
DEFENCE	-	-	-	-
CATERING	-	-	-	-
MEDIA	-	-	-	-
ENGINEERING	150	-	28	8

SCHEDULE OF TRAINED COMMUNICATIONS OPERATORS

(GREATER ADELAIDE AREA)

COUNTER DISASTER SERVICE	COMMUNICATIONS OPERATORS		
	FULL TIME	PART TIME	VOLUNTEERS
POLICE	60	-	-
FIRE (M.F.B.)	60	-	-
FIRE (C.F.S.)	16	-	130
MEDICAL	19	-	50
S.E.S.	4	-	90
TRANSPORT	11	8	3
WELFARE	30	4	16
SUPPLY			
DEFENCE	All Signals Personnel	-	-
CATERING	3	-	3
MEDIA	-	-	-
ENGINEERING	13	8	21

SCHEDULE OF COMMUNICATIONS TRAINING PROGRAMMES

(GREATER ADELAIDE AREA)

COUNTER DISASTER SERVICE	TRAINING OFFICERS	TRAINING PROGRAMME
POLICE	3 FULL TIME	1 week Induction Course Thereafter regular exercises
FIRE (M.F.B.)	1 FULL TIME	All recruit courses since January '83
FIRE (C.F.S.)	1 FULL TIME 10 VOLUNTEER	Ongoing
MEDICAL	2 FULL TIME	Ongoing
S.E.S.	1 FULL TIME 10 VOLUNTEER	Periodical courses
TRANSPORT	USE POLICE INSTRUCTORS	2 day Induction Course
WELFARE	USE POLICE INSTRUCTORS	2 day Induction Course
SUPPLY	USE POLICE INSTRUCTORS	2 day Induction Course
DEFENCE	-	-
CATERING	USE POLICE INSTRUCTORS	2 day Induction Course
MEDIA	USE POLICE INSTRUCTORS	2 day Induction Course
ENGINEERING	USE POLICE INSTRUCTORS	2 day Induction Course

AUSTRALIAN COUNTER-DISASTER COMMUNICATIONS STUDYWESTERN AUSTRALIAN STATE EMERGENCY SERVICEEMERGENCY COMMUNICATIONS STATUSINTRODUCTION

1. The Western Australian State Emergency Service (WASES) has been functioning in various counter-disaster capacities and levels of activity since the 1950's. For demographic reasons, governmental and community awareness of the organisation was only initiated following the impact of Cyclone Alby on the more populous South Western area of the State in 1978. Communications, in all respects was highlighted as a critical factor in the post-cyclone disaster response. In 1978, WASES essentially relied on an overloaded telephone system, and a scant radio service managed solely from the State Headquarters.

2. Since 1978, WASES has relentlessly pursued the corporate aim of gaining positive support for its communications services from the public and private sectors. This paper outlines the aims and results of those endeavours to illustrate WASES emergency communications status.

DISCUSSIONWASES Aim

3. The aim of the Western Australian State Emergency Service (WASES) Communications organization is to establish and maintain, communications facilities and services throughout Western Australia to satisfy the corporate aim of WASES. The corporate aim is to institute, maintain and co-ordinate counter-disaster response throughout the State.

Objectives

4. The WASES communications organisation principal objectives are to provide essential counter-disaster operational support activities:

- a. to optimise the use of Telecom Australia communications services and facilities,
- b. to complement Telecom Australia services and facilities with those of WASES to guarantee necessary communications co-ordination and

- c. to best utilise existing community communications resources for liaison and backup of WASES and Telecom Australia resources.

Introduction

5. In 1978, as a result of Cyclone Alby which devastated the South West of Western Australia, an executive counter-disaster communications group was convened under the chairmanship of Telecom State Manager (Operations). This State Communications Emergency Committee (SCEC) immediately instituted measures to provide a co-ordinated emergency communications organisation, and plan, to overcome the problems experienced during Cyclone Alby and any future disasters. The result was, following the recommendations of two sub-committees, that:

- a. the State Counter-Disaster Communications Support Plan was promulgated in March, 1981, and
- b. the phased upgrading of WASES communications systems was initiated in late 1979.

State Plan

6. The State Plan has been operationally tested and appears satisfactory. The Plan specifies the role of various community and WASES communications organisations in a disaster situation and appropriate contact details. The appropriate lines of authority and responsibility are also drawn. A pilot regional plan of similar philosophy is currently under development for the Northern Gascoyne/Murchison areas.

Upgrading

7. Prior to Cyclone Alby, WASES equipment and manpower support, of all types, was scarce. After Cyclone Alby, under the aegis of the SCEC, WASES was required to establish communications resources of certain types at three levels:

- a. State. At the Belmont, State Emergency Operations Centre (SEOC).
- b. Regional. At each of a planned 12 regional headquarters.
- c. Local. Within each of 139 local government authorities (cities, towns and shires).

The main contribution to the WASES communications organisation under this upgrading plan has been the establishment of HF radio base facilities at each headquarters location. Due to delays in funding since 1980, only 17 HF stations have been upgraded. The remaining obsolescent radio facilities are being maintained at considerable financial and operational expense.

Radio Services

8. WASES current radio communications philosophy is:
 - a. HF and VHF services for country SES organisations in low population areas;
 - b. VHF and UHF for high-density population areas, including metropolitan areas, and
 - c. HF, VHF and UHF for State Headquarters.

State Headquarters

9. The SEOC Belmont, comprises remote and local HF disaster stations, VHF local facilities and one UHF talk through repeater (TTR). These operate in the bands 2-14 MHz, 163-166 MHz and 458-468 MHz respectively. Each facility is supplemented with limited mobile and hand-held radio equipments to support any extraordinary requirements which may arise during a regional or multi-regional operation.

Regional Headquarters Metropolitan

10. In the two metropolitan regions, the paucity of NDO-endorsed UHF radio equipment has dictated some interim variations to the SCEC proposal. Of the nine UHF TTR's to be provided, three on individual channels are in service. As the Local Voluntary Emergency Services (LVES) have very limited, if any, UHF capacity at this stage, VHF radio systems are also established at each metropolitan regional headquarters (Mt. Hawthorn and East Fremantle). Metropolitan Headquarters have no requirements for the HF services, except for 27MHz handhelds, as any untoward HF requirements will be co-ordinated through the State Headquarters.

Regional Headquarters Country

11. As the first phase of communications upgrading, all country regional headquarters are essentially treated

as medium-to-low population centre headquarters. Under this premise, each is provided with State and Regional HF radio stations, both remote and local, as well as a VHF radio station for town use. TTR facilities for specific regions are currently being studied.

Local Headquarters

12. Each LVES Headquarters when suitably equipped, eg with vehicles or rescue teams, is provided with VHF manpack and mobile facilities. In country areas, similar HF equipment is provided and in metropolitan areas UHF equipment may be issued to eligible groups. HF handheld radios are generally issued to each group. In each case, the equipment is intended to provide internal communications between teams, mobiles, local and regional headquarters. Operationally, though they have the capacity, local groups do not normally use State Headquarters controlled channels.

General

13. Radio communications facilities within WASES are comprehensive although not exactly plentiful, with some 600 equipments to meet the communications demanded of 152 headquarters. By invoking elements of the State Communications Support Plan, the emergency radio communications network capability can be effectively magnified to complement those facilities available within WASES.

Other Services

14. Although WASES co-ordinates significant emergency radio communications effort, other Telcom-dependent facilities are also available to support counter-disaster activities:

- a. Telephones. Telephones are the primary means of communications for many personnel involved in counter-disaster operations. WASES philosophy is to guarantee that, while the integrity of the Telecom service is intact, the WASES telephone systems at State and Regional Headquarters will efficiently handle all the telephone traffic. To this end, a Phillips PABX (D1200) has been installed at State Headquarters with sufficient operational capacity to meet all foreseeable requirements. Telecom Australia provided the consultant services to meet this Headquarters needs and

and to date the redundancy included in the telephone system has guaranteed that it functions perfectly in all situations. Again, to meet predictable regional needs, similar philosophies have been adopted with each regional headquarters having, or planned to have, optimum telephone services within the headquarters. For several reasons, including economy, the Commander series small business systems are being implemented as the common regional headquarters system.

- b. Telex. State and regional headquarters are each provided with telex facilities. Off-line preparation capability is a key feature in each case. These services enable timely relief of traffic congestion on associated organisations facilities, eg cyclone notification lists are issued by WASES to guarantee counter-disaster key personnel are warned, but has the spin-off of relieving Bureau of Meteorology of some traffic.
- c. Facsimile. WASES operates facsimile services between State and regional headquarters. Operationally these have proved much more efficient than telex services, providing both written and map material in minimum handling time. These facilities will eventually be interfaced to HF radio services in a similar manner to those used by oil exploration companies in northern Western Australia.

Manpower

15. WASES has two staff officers on permanent officer strength who are responsible for all aspects of communications related to counter-disaster activities. Both were professional communications officers at induction. There are no part-time officers.

16. Volunteer operating personnel are involved at all levels of disaster communications within WASES. Of some 4,000 WASES volunteers, there are approximately 20 adequately trained operators within the State who can meet WASES proficiency requirements. The remainder, to their credit, are self-trained.

17. To meet this vacuum in training, WASES has as recently as March, 1983, endorsed a substantial volunteer communications training programme to increase the knowledgeable number to approximately 120 operators. These trained personnel will then be expected to improve the quality of regional and local operation and maintenance of WASES radio equipment.

SUMMARY

18. WASES currently has approximately 600 radio equipments spread across the State for both primary and backup communications services. This number is less than satisfactory for elementary operational requirements. Trained operating personnel are even more scarce.

19. Telephone, telex and facsimile services within WASES have been proved operationally. Though Telecom-dependent, they are an essential asset when overloading, or failure of other disaster organisations occurs, or is imminent. WASES permanent staffing is presently insufficient to achieve all corporate needs.

CONCLUSION

20. WASES communications state has been drawn, correctly, as being widespread and operationally optimised in terms of available radio and telephonic services. There is, however, a need for additional radio equipment relative to organisations needs. The most notable current deficiency is in the staffing operational communications management. When these needs are met, the WASES communications organisation will be that sufficient and necessary to meet the counter-disaster effort.

COMMUNICATIONS ARRANGEMENTS WITHIN THE
NORTHERN TERRITORY COUNTER DISASTER ORGANISATION

1. The counter disaster arrangements within the Northern Territory are based on the Counter Disaster Organisation which consists of the Counter Disaster Council together with Regional and Local elements. This organisation is established under the Northern Territory Disasters Act. The Counter Disaster Council is appointed by the Chief Minister and is comprised of the Territory Counter Disaster Controller, the Director of the Northern Territory Emergency Service who is the Executive Officer and other members who because of their expertise in certain areas are able to make a contribution to the Council. Provision is also made for the appointment of a representative of the Commonwealth if requested.

2. Through the production of counter disaster plans the resources of the Territory including communications resources are co-ordinated. All counter disaster operations are controlled by the Territory Controller. Operational support is provided by the Director, Northern Territory Emergency Service and this includes communications support.

3. To fully appreciate the Counter Disaster Communications problem in the Northern Territory it is necessary to be familiar with the geographic features of the Territory. The area of the Territory is approximately 2 000 KM by 1 000 KM covering almost 1/6th of the country. Including the offshore islands there is in excess of 1 700 KM of cyclone prone coastline. The climate conditions vary from very hot and dry in the southern area to monsoon country in the north.

4. The present population is approximately 130 000 which is distributed as follows:

Darwin	60 000
Alice Springs	15 000
Nhulunbuy	6 000

5. The balance of the population (49 000) is located in smaller towns, settlements or camps throughout the Territory.

6. These smaller pockets of population invariably are at a distance to main centres and to each other and in many cases can be completely isolated at certain times of the year.

7. To overcome the problems of distance and isolation communications have been provided by the following:

- a. Commonwealth Government Facilities
- b. Northern Territory Government Facilities
- c. Independent Facilities

8. Responsibilities for the operation of these facilities and their associated communications network remains with the owner organisation during counter disaster operations and is exercised through the administrative centres of Darwin and Alice Springs.

Commonwealth Government Facilities

9. Commonwealth Government Departments and instrumentalities have a variety of communications facilities some of which are incorporated into counter disaster plans and others, such as Defence Force Communications may be made available under certain circumstances.

10. The major Commonwealth communications system is Telecom Australia. Apart from the usual Telephone and Telex services, two services of particular value to the Northern Territory are Out Post Radio and Radio Telephone Services. The Outpost radio operates a continuous HF service from Darwin known colloquially by its callsign VJY. Outpost radio provides a telegram service, the passage of meteorological data and a medical service. A "chatter channel" is incorporated to enable the passing of messages on an informal basis between subscribers.

11. The number of subscribers to these services is:

- a. Outpost Radio
 - (1) Fixed Stations 198
 - (2) Mobile Stations 477
- b. Radio Telephone Subscribers
 - (1) Katherine 80 (expected to rise to 100)
 - (2) Alice Springs 80

Northern Territory Government Facilities

12. The Department of Transport and Works is responsible for a Radio Communications Group which installs, maintains and in some cases, monitors the majority of Government radio facilities. As well as its own Departmental network client

departments include:

- a. Department of Health
- b. Department of Education
- c. Conservation Commission
- d. Department of Primary Production
- e. The Bushfires Council of the Northern Territory
- f. Department of Mines and Energy
- g. Northern Territory Housing Commission
- h. Department of Community Development
- i. Northern Territory Fire Service
- j. Northern Territory Emergency Service
- k. Northern Territory Police

13. Radio statistics of major government users are attached at Annex A and all are available for counter disaster purposes. The Northern Territory Emergency Service communications facilities provide the dedicated Counter Disaster Control network throughout the Territory. The Service also administers the Berry Springs Broadcast Transmitter which covers the Darwin and surrounding areas.

Independent Facilities

14. A range of independent communications facilities operates throughout the Territory and includes:

- a. Royal Flying Doctor Service (Southern area only)
- b. St. John Ambulance
- c. Church Organisations
- d. Missions
- e. Mining Companies
- f. Exploration Companies
- g. Pastoral Enterprises

h. Transport Operators.

15. Examples of independent facilities are also included at Annex A.

Communications Personnel

16. Each organisation whose communications equipment is used for counter disaster purposes normally provides its own operators. The Northern Territory Emergency Service provides training for employees of other organisations where additional operators are required.

17. Voluntary members of the Northern Territory Emergency Service are trained as operators for duty in operations centres throughout the Territory and to supplement existing operators where required.

Summary

18. During Counter Disaster Operations many organisations have been allocated responsibilities and therefore their communications are dedicated to that task. Other organisations are able to make their facilities available to the Counter Disaster Organisation when required. This procedure ensures that there is an established framework within which the communications resources throughout the Territory are co-ordinated to provide the most effective utilisation during counter disaster operations.

ANNEX A
NORTHERN TERRITORY EMERGENCY SERVICE - SELECTED COMMUNICATIONS FACILITIES

ORGANISATION	HF BASE STATIONS	HF MOBILES	VHF	UHF	TOTAL
<u>NORTHERN TERRITORY</u> <u>GOVERNMENT</u>					
Department of Transport and Works					
Department of Health	150	50			500
Department of Education (Schools)	50	6			200
Housing Commission				50	56
Conservation Commission	30	120			50
Department of Primary Production	20	40			150
Bushfires Council	3	14			60
Department of Mines and Energy	10	30			17
Department of Community Development			40		40
Northern Territory Police	50	150	25	200	425
Northern Territory Fire Service				90	90
Northern Territory Emergency Service (Counter Disaster Control Network)	34	22	139		195
<u>OTHERS</u> <u>Telecom</u>					
Out Post Radio	198	477			275
Royal Flying Doctor Service	150				150
St. John Ambulance	2	20		73	103

COMMUNICATIONS STUDY24 - 27 JULY, 1983Conduct of Discussion Exercises

1. Six syndicates were formed from delegates to the Study. All syndicates were required to consider the same general requirement for each discussion exercise; late in the consideration period, one syndicate was designated to present their findings in plenary session, and other syndicates were invited to comment on the presentation before the topic was opened for general discussion.

2. Members of the Study Working Party and of the College Directing Staff acted as resource persons for the syndicates. Syndicates were required to lodge an outline of their findings for each discussion exercise with the Study Secretariat.

Discussion Exercise Requirements

3. The requirements given to syndicates for the four discussion exercises were as follows:

a. Counter-Disaster Communications Requirements.

Irrespective of costs, current or future capacities and capabilities, list in priority order, the requirements for a national counter-disaster communications network.

From these priority requirements how do you develop the system, taking into account all areas of Commonwealth/State/Territory/Local Authority/Industry interface and co-ordination requirements in the pre-disaster, disaster and post-disaster phases.

b. Counter-Disaster Communications Capabilities.

From the papers presented and your earlier discussions, prepare a summary of Australia's current capabilities.

In identifying those areas which you consider to be deficient in capability, propose solutions.

c. Short-Term Improvements in Counter-Disaster Communications.

From examination of papers presented and your earlier discussions, identify practical short-term improvements in our national counter-disaster communications in at least the following areas:

3.
 - c. (continued)
 - * Telecom
 - * Frequency allocations, usage and management
 - * Licensing arrangements
 - * Operator training
 - * Intra-State/Territory liaison and co-ordination
 - * Inter-State/Territory/Commonwealth liaison and co-ordination
 - * Support from Australian Defence Force (ADF), including the Defence Communications Network
 - * Overseas Telecommunications
 - * Broadcasting and other Media Liaison
 - d. Long-Term Improvements in Counter-Disaster Communication. From examination of papers presented during the past two days, your earlier discussions and from your own collective experience, identify practical long-term improvements to our national counter-disaster communications capability. Your examination should at least include:
 - * Satellite implications
 - * The perceived best means of communication in the immediate disaster area
 - * The perceived best means of communication between Commonwealth/State/Territory/Local Authority Headquarters
 - * The role of data communications
 - * Operator training
 - * Equipment commonality
 - * Dedicated back-up systems for use in an emergency.

Discussion Exercise Findings

4. The findings from plenary sessions following the consideration of the above requirements are embodied in the conclusions contained in the Report of Proceedings (paragraphs 24-28 inclusive).

